FABRICATION ASSEMBLING **METAL INDUSTRY** PLATING FINISHING

Volume 35 SEPTEMBER, 1937 *Number 9*

Editorial Comment

Corrosion Testing

ONE of the most difficult problems confronting the manufacturer of fabricated metals has always been the development of corrosion resistant properties. Corrosion is such a wide, flexible term; there are so many corrosives and so many strengths or concentrations that general statements are impossible.

A paper entitled "*Corrosion Testing Metals for Copper Alloys*" by *D. K. Crampton* and *N. W. Mitchell* of the Chase Brass and Copper Company, Waterbury, Conn., presented at the recent meeting of the American Society for Testing Materials, offers a method which holds promise of supplying a test which will be indicative of actual operating conditions. The authors class corrosion phenomena according to causes and results and indicate that the alternate-immersion and water line tests incorporate many of the causes and forms of corrosion. Their outstanding point, however, was the recommendation that tensile strength measurement after subjecting samples to corrosion is the best means of evaluating corrosion losses. Loss in weight, the present method, is subject to many errors. For example, a few deep pits, causing little weight loss, may injure a part more than a large number of surface pinholes, causing heavy weight loss.

We are impressed by this recommendation. As a standard measurement it seems to have the ear-marks of a practical test as against the possibility that weight loss alone may be merely academic in its indications.

Plating Estimates

EVERY man who has been in business for any length of time is supposed to know what it costs him to operate. He is also an expert, and takes special pride in his estimates on new work. "I know what a job is worth!"

Let us recount a little story. At a recent meeting of a local trade association of job platers, a number of samples of finished work were passed around at the meeting. All members were allowed to examine them, were given the composition of the base metal and the grade of finish desired, (various undercoats, etc.). The quality was to be as per sample. Then they submitted estimates on folded, unsigned slips of paper. Below are the records of a few typical examples:

Actual Price	*Estimates*
5c	2c to 10c
14c	8c to 30c
1½c	½c to 3c
$1.50	$1.00 to $5.00
70c	40c to $1.50

Allowing for the fact that different shops were equipped to do different classes of work, and allowing for the fact that the estimates had been given after only a couple of minutes study, we still are confronted with a spread in figures which is impossible to explain on any legitimate grounds.

It was generally agreed at the meeting that nine platers out of ten do not know how to estimate.

Joining Metals

IN THE manufacture of metal products, no group of operations is more important than assembling. No matter how cheap the base metal is, no matter how simple and automatic the stamping and metal forming operations are, no matter how easily and efficiently the finish is put on, if the assembly is complicated or imperfect, the cost rises out of reason and the finished product is likely to be unsatisfactory, from either a manufacturing or marketing standpoint.

No operation in assembling is more important than joining, and in recent years, amazing strides have been made in the most recent process of joining metals—welding.

We begin in this issue a series of articles on the welding of copper and copper base alloys, as a function in the manufacture of metal products. We intend to go on with this series and to cover in the same detailed fashion, the welding of other non-ferrous metals, in this way rounding out information on what has become one of the key departments of metal manufacture.

We commend these articles to the attention of our readers.

Methods of Joining Copper Alloy Products. Part 1: Tubes, etc.

Welding methods have become vitally necessary (a) as an element in facilitating design, (b) as en economical manufacturing method, (c) as an aid to good service performance and (d) as a convenient means of making repairs. Examples are taken and analyzed to help the designer, shop superintendent and welding operator to a better understanding of the problems involved.

By I. T. HOOK

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Connecting Copper-Alloy Tubing

STARTING with the simplest connection involving a copper alloy, we have the problem of joining various sizes and various wall thicknesses of copper and copper alloy pipe and tube. Such tubing goes into a multitude of services conveying gas, oil, water, steam, chemicals and into heat exchangers operating at temperatures from -112°F to 400°F and at pressures from a 28" vacuum to 1200 pounds per square inch. A still more familiar type is the water-to-air heat exchanger made in a multitude of forms from thin crimped copper or brass sheet or finned tube held together and sealed with soft solder. The automobile radiator core and heater elements as well as the dwelling and shop air heaters are familiar examples.

Tube Alloys

In order to secure a proper understanding of the problem, we should know with what materials we are dealing and their more common properties. Thus, while a great many copper alloys can be made in tubular form,

TABLE 1. Copper Tube Alloys, Approximate Properties

Approx. Composition, %			Tensile Strength PSI		Elongation in 2" %	Mod. of Elas.	Coef. of Expansion x 1000 per	Thermal Conduc-	Melting Point Degrees	
Copper	Zinc	Tin	Hard	Soft	Soft	PSI/1000	Deg. C$_\pi$	tivity	C	F
High conductivity copper, electrolytic copper, tough pitch copper, oxygen bearing copper. Used for electrical conductors and air-fin radiators:										
99.90+			45000	33000	35	16000	.0177	.923	1083	1981
Deoxidized copper. Includes nearly all copper pipe, tubes and sheets for welded equipment.										
99.90P+			45000	35000	35	16000	.0177	.80	1083	1981
Red Brass 85, rich low brass. Brass pipe and tube more corrosion resistant than yellow brass pipe.										
85	15	....	.....	42000	42	15000	.0187	.38	1020	1868
Yellow brass pipe. Mostly used for threaded brass pipe.										
		Lead								
67.50	32	.50	.....	44000	45	14000	.020	.27*	938	1720
Muntz metal. Used in clean, fresh water condensers and heat exchangers.										
61.5	38.5	.....		55000	50	13000	.0207	.300	910	1670
Admiralty. The tin improves the corrosion resistance of the alloy for steam condenser service.										
		Tin								
70	29	1	....	55000	60	15000	.0202	.263	.935	1715
Aluminum Brass, Ambraloy 927. The aluminum improves the Brass against impingement attack for steam condenser service.										
		Aluminum								
76	22	2	95000	56000	63	15000*	.0196*	.240	970	1778
Ambrac. Excellent corrosion resistance for steam condenser and other types of service.										
		Nickel								
75	5	20	70000	52000	45	19000	.0164	.092	1150	2102
70:30 Cupro-nickel, "super nickel." Excellent corrosion resistance for steam condenser and seawater service.										
		Nickel								
70	....	30	70000	56000	45	20000	.0162	.069	1225	2237

P = Fractional percent of phosphorus, silicon or other deoxidizer present.

K = Cal./sq. cm./cm./sec./Deg. C. at 20° C.

* = Estimated.

π = Average value for temperatures from 25° C. to 300° C. (77° F. to 572° F.). The contraction strains from brazing and welding temperatures are greater than is indicated by these values.

the demand can be supplied by a comparatively few. Table 1 lists a typical group of copper alloys used for tubes or fins together with those properties of interest to the fabricator and user.

Copper and copper alloy metals offer good resistance to a wide variety of corroding agents. Nevertheless, they are not all equally resistant to the same reagent and conditions may often vary the corrosiveness of a given solution in contact with the same metal.

Specific problems may be referred to the metal manufacturer for consideration by the technical staff maintained for that purpose.

Remarks

In addition to the above standard tube alloys, a number of other compositions are drawn into tubes for special purposes. Some of these are as follows:

(a) Nickel silver tubes to match in color equipment made of nickel silver sheet.

(b) Oreide, Zinc-bronze — red brass plus tin to approximately 2% which improves the strength, fatigue life and resilience. Used for Bourdon gauge tubing, etc.

(c) Phosphor bronze Used for wear resisting bushings. Sometimes carries lead for furthering this purpose, and to improve machinability.

(d) Everdur used for special equipment and for electrical conduit in corrosive situations.

Table 1, Explanation

The properties in Table 1 (p. 434) have an important bearing on the connecting and subsequent use of the copper alloy tubing. In general, the tensile strength of the tubing in the annealed state is the more important as most of the pipe and tubing, with perhaps the exception of copper tubing, is furnished annealed or semi-annealed. Moreover, except for the soft soldered connections, all of the connections made by brazing or welding methods make the tube soft within an inch or two of the fitting.

Hence in computing the resistance of the tubing to internal pressure, the safe stress should be based on the tensile strength of the material in the soft condition rather than on that of the cold drawn tubes.

On the other hand, for most sizes of pipe and tubing, the resistance to *external* pressure causing collapse is a function of the modulus of elasticity and ratio of wall thickness to mean diameter. However, where the compressive stress is greater than the yield point, the safe external pressure must be based on the yield point of the material as well as the modulus of elasticity and the dimensions*. Since the yield point of annealed copper and some of the tube alloys is relatively low, it is often desirable to use cold drawn tubing for services calling for resistance to external pressure. Cold drawing is quite effective in raising the yield point.

Fig. 1. Copper preheater with expansion element in shell. (Courtesy E. B. Badger & Sons Co.)

The coefficient of expansion is given in Table 1 as it is often necessary to take this property into account in laying out a welded connection. Though ordinary temperature ranges, which are seldom more than two hundred degrees Fahrenheit, cause length changes of only a small fraction of an inch, these changes will not be denied and often very high stresses are developed unless provision is made for such length changes. Figure 1 shows one means of taking up the difference in expansion between the tubes and shell in a copper preheater. With frequent variations in temperature between tubes and shell, there would soon be a loosening of the tube connections at the headers, were there no provision for absorbing the corresponding variation in length. In Figure 1, a copper expansion joint is welded into the center of the shell which allows the latter to lengthen and shorten moderate amounts with little change in stress.

The thermal conductivity is also given in Table 1. It is this property, combined with excellent corrosion resistance, that has made copper and copper alloy tubes the first choice for

*See S. Timoshenko, Strength of Materials, Part II, Page 602 (D. Van Nostrand Co., 1930).

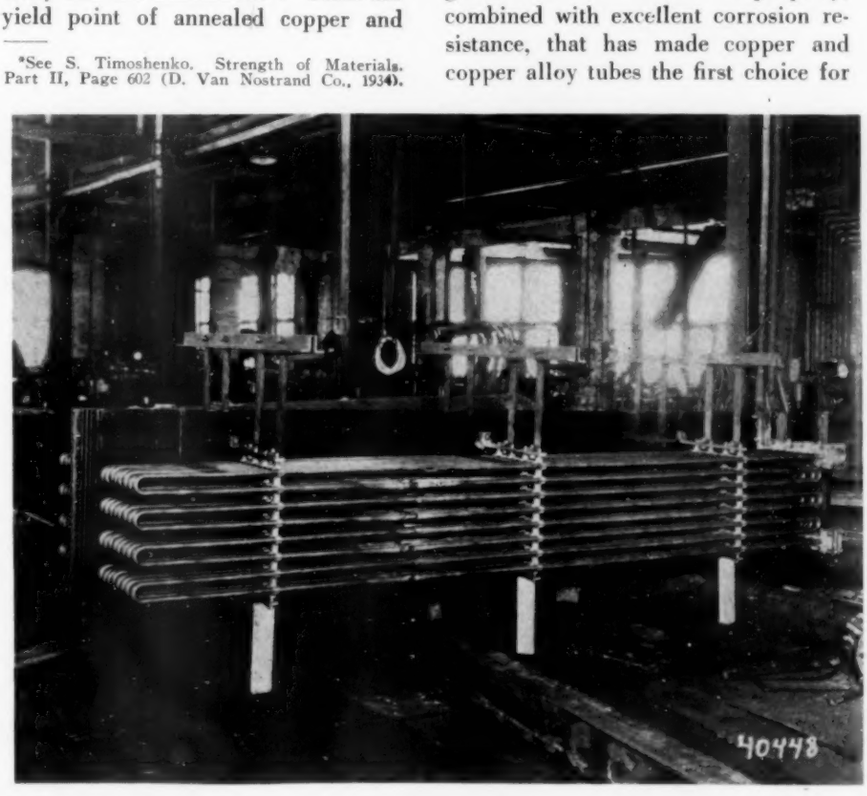


Fig. 2. Copper tube economizer for recovering heat in waste water. (Courtesy Whitlock Coil Pipe Co.)

so many heat exchanger applications.

Figure 2 on page 435 shows an economizer which recovers the heat from dirty laundry water. Set into a concrete trench or a metal tank, the thin walled copper tubes conduct the clean water through the hot dirty water extracting from the latter the one thing of value it contains. The clean water, by this means, arrives in the laundry hot and ready for work.

Connections for Pipes and Tubes

There are fifty or more different designs for making a pipe joint to say nothing of the great variety of fittings. However, for our present purpose, we will ignore all mechanical joints giving consideration only to those sealed with molten metal, thus:

Soft Soldered Connections

Soft solder has proved to be a very useful and desirable agent for sealing connections in copper tubing. It has two outstanding advantages, (a) it is applied at a comparatively low temperature, 400° F. to 700° F. and (b) it is the only metal sealing agent that can be applied without annealing the tubing. The fact that it is applied at such a low temperature means that it is comparatively easy and inexpensive to apply. Furthermore, when properly installed, soft soldered copper tubing gives excellent service in domestic plumbing. For the usual cold water pressures, 150 pounds per square inch and less, it makes a very satisfactory connection. For hot water lines, soft solder must be used more circumspectly as its creep strength drops sharply with increase in temperature.

Many designs of soldered connections are possible. Various designs of fittings with different methods of applying the solder are commercially available. In general, however, nearly all of them have a recess which is a close fit to the outside diameter of the tubing as illustrated in Fig. 3.

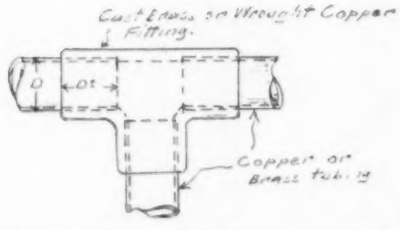


Fig. 3. Soft soldered connection to recessed fitting

The copper or brass tubing is manufactured to very close tolerances on the outside diameter and the recess is usually reamed to size. Thus, there is a very decided capillary attraction which, under the correct temperature and surface (properly fluxed) conditions, will draw the solder into the joint no matter what the position. Various conveniences such as (a) powdered solder and flux mixed into a paste, (b) inserted rings of solder, (c) solder feeding holes, (d) temperature indicating paints, etc. have been commercialized. In general, however, clean, fluxed surfaces, preferably not more than .003″ apart, and correct temperature conditions will insure a satisfactory connection.

It will be noted that in the soldered recessed fitting, the solder has only two functions (a) to seal the contents of the tube at the connection and (b) to hold the tube in place longitudinally. The latter stress is usually small. The longitudinal stress arising from the pressure is very nearly half the circumferential stress in all cylindrical tubes and shells. Since the depth of the recess is commonly 13 to 22 times the tube wall thickness, the unit longitudinal shear stress in the solder due to pressure within the pipe is relatively small.

And the only other source of longitudinal stress would be from changes in length due to temperature variations and dead weight of tube. The first may be avoided by allowing the tubing longitudinal freedom and the latter could only be serious in a vertical line in a tall office building which line can usually be supported so as to avoid strain on the connections.

Fig. 4. Heat exchanger for CO_2 refrigerating system. (Courtesy Whitlock Coil Pipe Co.)

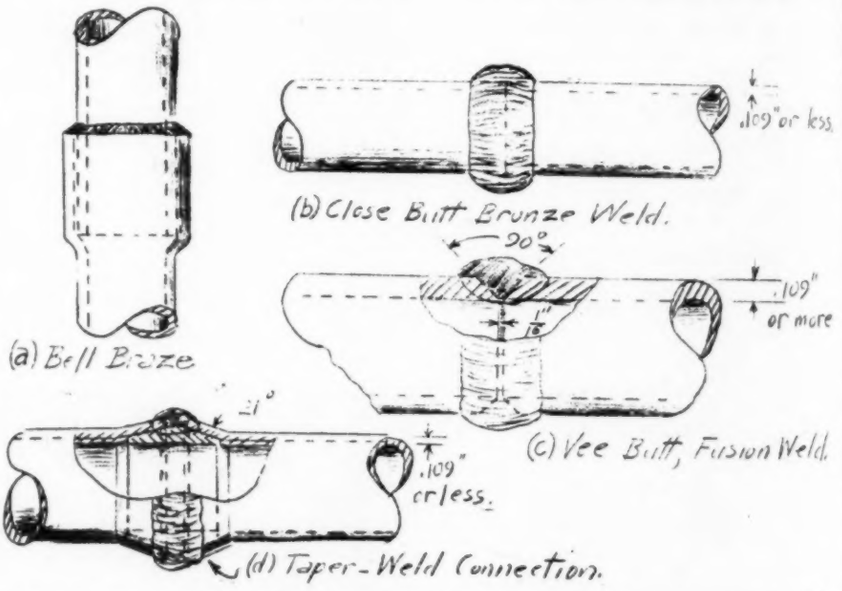


Fig. 5. Types of brazed and bronze welded line connections in copper and low brass tubes

As for sealing the joint, the solder is exposed to pressure and corrosion attack over a thin end rising only, while, if the recess is properly filled, the depth of solder is, as was pointed out above, commonly 13 to 22 times the thickness of the tube wall. Under such conditions, the joint would withstand a corrosion attack for an indefinite period and its resistance to pressure is limited almost altogether by the strength of the tube and fitting. Figure 4 illustrates a form of heat exchanger used in a carbon dioxide system where

the soft soldered connections must withstand the exceptionally high pressure of 1200 pounds per square inch. In this case, the copper tubes are first expanded to the 4" thick steel header and then sweated with soft solder.

Soft Solder at Elevated Temperatures

The most trying situation for a soft soldered connection is one in which it is subjected to continuous heat. The lead-tin solders in particular are weak in creep resistance when hot. Thus the common 50 lead, 50 tin soft solder which will carry safely a shear stress of approximately 600 pounds per square inch at 70°F, will not carry safely more than a third of this value at the temperature of boiling water.

In general this means that soft soldered connections are three times as resistant to shear, creep strains in cold water lines as they are in hot water or steam lines. One factor contributing to the success of the soft soldered seal in the carbon dioxide evaporator of Figure 4 is that the temperature is very low, approximating —80°C. It is obvious, therefore, that hot water lines with soft soldered connections should be supported in a manner that will eliminate as far as possible all longitudinal stresses due to weight of pipe or restraint when the line is expanding or contracting with the rise or fall of temperature.

Table 2. Soft Solders

Composition, %		Melting Point Deg. F*	Remarks
40 tin	60 lead	459	Plumbers wiping solder, long mushy stage.
50 tin	50 lead	415	Common solder. Excellent flowing properties on Copper and Brass.
63 tin	37 lead	358	Lead-tin eutectic. No mushy stage—goes directly from liquid to solid.
5 tin	95 lead	604	Inexpensive, high melting point lead-tin solder. Indifferent flowing on copper and brass.
95 tin	5 antimony	468	Non-toxic soft solder having higher creep strength than the lead-tin solders at 212° F. Good flowing properties on Copper and Brass.
5 silver	95 cadmium	730$_\pi$	Good creep resistance at 212° F.

* = Completely liquid.
π = Estimated.

Soft Solder Alloys

A great variety of soft solders are available. Some of the more common ones are given in Table 2.

As was pointed out above, the soft solders are favored because of their low melting temperatures which make them readily applicable by gasoline, city gas or acetylene-atmospheric air torches. They have relatively good corrosion resistance though, in this respect, some authorities say they are inferior to the brazing and silver soldering alloys.

The soft solders "wet" copper and brass readily and are, therefore, drawn into the connection by capillary attraction over quite a range of fits of the tube end to the fitting recess. Their weakest feature is their low creep resistance at elevated temperatures.

A *flux* is a prime essential in the application of soft solders. These fluxes are made up of zinc chloride or zinc chloride plus ammonium chloride in water, alcohol, petrolatum or tallow. sometimes the chloride is made more active by a small addition of hydrochloric acid. Commercial non-corrosive flux pastes are satisfactory if the surfaces are chemically clean before the flux is applied.

This article will be continued in an early issue.—ED.

Rat-Tails on Yellow Brass Castings

Q.—We have run into trouble due to rat-tails on brass castings made of yellow brass—70% copper, 28% zinc, 1% tin and 1% lead.

We have the pattern gated four pieces on a gate. The rat-tails show up on the flat surface of the part.

We have used No. 0 and No. 1 Albany sand. These locks must be absolutely perfect on the surface. We ran into dross at first on the castings along side of the gate, but we have eliminated this and our main trouble now is the rat-tails.

We have tried various mixtures of metal and sand but still run into this trouble. We have added a small amount of aluminum to our metal; we have melted the metal in No. 60 crucibles using both coke and oil and we have poured these castings at various temperatures tested with our pyrometers.

A.—We have analyzed your letter and would say your trouble is caused by gas being pocketed in the mold, caused by the rush of metal, and it sets before the gas can escape.

We suggest that you draw vents off the mold at the gas traps, and this should help eliminate your troubles. We also suggest you continue to use 2 ozs. of aluminum per 100 lb. of metal; also suggest you use a core skim gate.

If this will not eliminate your trouble, ship us a sample casting.

W. J. REARDON.

Electroplated Patterns

Q.—Recently we had an inquiry regarding making copies of wood patterns for foundries in metal by the electroplating process. This consisted of making an impression of the wood pattern in plaster of paris and copper plating the impression and filling the copper shell with solder. After some weeks of experimenting we produced a satisfactory job, but local foundrymen whilst seemingly interested to some extent, do not come across with the orders.

Could you tell us if you have had experience of these patterns and what is your experience of them? We have an idea that if we electroplated a thin film of iron onto the copper face of the pattern we would get a job that would withstand the action of the sand, but we hesitate to go to this expense if there is something fundamentally wrong with this type of pattern.

A.—Such patterns have been made with a great deal of success in the last fifteen years. We suggest you look up at the public library the back numbers of METAL INDUSTRY, Dec. 1923, p. 499. You will find a description of this process that will give you the information you desire.

W. J. REARDON.

Manufacturing Brass Parts for Hose Assemblies

Modern methods applied to the making of couplings and nozzles by the Boston Woven Hose & Rubber Co.

By **L. A. ROWE**
Supervisor, Brass Dept.
***As told to* FRANCIS A. WESTBROOK**

THE Boston Woven Hose & Rubber Company, Cambridge, Mass., one of the oldest and largest makers of hose in the country, operates a brass foundry and a machine shop for the production of brass couplings and nozzles for use on all varieties of hose. The company manufactures these accessories for the purpose of controlling the quality of all parts used in the assembly of its hose. Many times hose is condemned through no fault in the making of the hose, since the failure occurs by defects in the couplings. The company has also found the operation of its own shop to be economical both from the point of cost and the elimination of delays in receiving couplings or nozzles purchased in the open market.

The Brass Foundry

The foundry, which is housed in a brick, one story building 165′ x 77′ contains equipment for core making, sand handling, molding, melting and cleaning or snagging castings. Adequate ventilation is secured by a 60″ motor driven fan connected to a system of ducts and hoods arranged so as to remove fumes from all pouring points, besides providing general ventilation to the molding area. A system of overhead monorail tracks serve the melting and pouring areas.

Core making is carried on in a room set apart for this purpose so as to secure clean conditions and no hazard of contamination of core sand by foreign substances. Cores for the smaller sized nozzles and couplings, which can be made in quantity production schedules, are made by machine. A core blowing machine operated by air at 125 lb. pressure, is used for this type of core. Larger cores which are required are made by hand bench work. Cores are baked in a gas-fired oven of the standard type.

Stock sand is stored in large bins situated near a power driven riddle and a sand mixer. Salvaged sand is cleaned by a Royer separator and blended with new sand in riddles.

Molding is done with six molding machines of the pattern draw type, and two of the squeezer type. These machines are used for the smaller sized couplings and nozzles. Production of larger sized parts is done by hand molding. The molding area is separated into two parts by an overhead monorail system so that molten metal can be brought from the furnace to the completed molds with a minimum amount of handling.

Brass melting is done in an electric arc furnace of the tilting type and in twelve pit furnaces of the standard type. The electric furnace is not as economical as the coke fired pit type when large percentages of chips and turnings are re-melted. Since economy requires the steady re-melting of salvaged metal the pit furnaces are used for the greater part of the melting. The electric furnace is reserved for special service where its use is found economical. The control of the melting operation is governed by pyrometers and by test of specimens from melts.

A section of the foundry building is set apart for the storage of metal. Metals are issued in ingot form to the melters as required by shop orders. Brass turnings, borings and chips are salvaged and passed through a magnetic separator before re-melting so as to remove any ferrous content.

Castings pass from the molding area to the cleaning or snagging room, which is equipped with six double grinders of standard pattern and two slotters for removing sprues. A metal band saw is also used for trimming rough castings. Small castings are finished clean in a sandblast chamber.

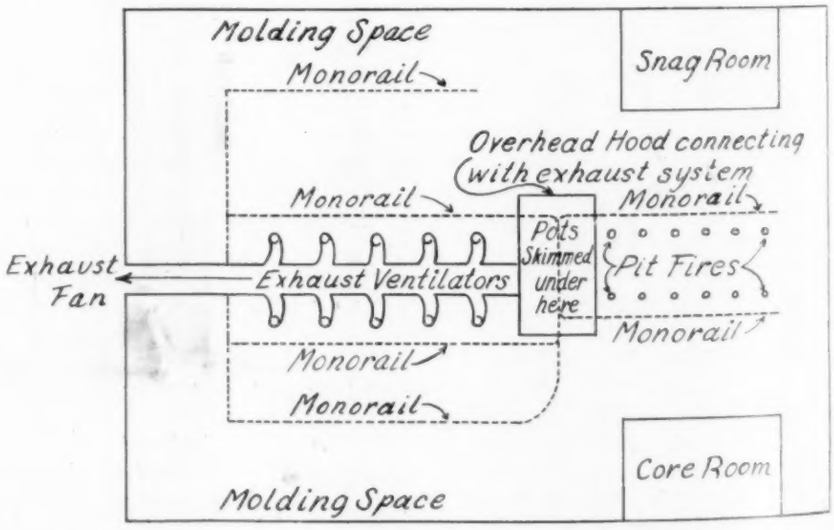


Fig. 1. Layout of the foundry of the Boston Woven Hose & Rubber Co., Cambridge, Mass.

and a standard tumbling barrel is used for special cleaning operations.

Ventilation of the foundry melting and molding areas is cared for by a large motor driven exhaust fan which removes smoke and fumes through a system of hoods and ducts placed so as to serve the pouring operations. General ventilation is by means of roof ventilators, and special ventilation is provided for grinders in the snagging room.

One part of the foundry buildings is set apart for a pattern shop. A section of this room is devoted to pattern storage where all active patterns are kept so as to avoid any loss in time by securing patterns from the general store room. Cinders from the pit furnaces are ground and washed in a Sly cinder mill for the recovery of metal.

Particular attention has been given to lighting in the foundry, and high intensity vapor lamps are used for general lighting supplemented by incandescent lamps where localized lighting is required.

The Machine Shop

The machine shop is a 2-story brick building 164′ x 54′ which is entirely devoted to the finishing of brass products. The clean castings come from the foundry in tote pans by hand trucking across an ingenious swing bridge and are taken to the upper floor by an elevator.

The castings are divided into three classes known as "tail couplings," "expansion ring couplings" and "nozzle parts"; as the production process varies with each class, a brief description of each of these may add to making clear several operations:

Tail couplings consist of three brass castings: the nipple or tail, which is inserted in the hose and secured by an outside clamp; the swivel, which connects the tail with the other half coupling, and the male end half coupling which screws into the swivel.

The expansion ring coupling is made in three parts; a half coupling with male thread; a half coupling with provision for attaching the swivel, which has a female thread. The half couplings are grooved in the bore so that the hose can be gripped between the coupling body and an expansion ring fitted into place by mechanical pressure in a special press.

The nozzle assembly calls for three parts; the sleeve or body; the spindle or valve; and the nut.

Manufacturing Operations

The tail coupling process requires a simpler finish than either the expansion ring coupling or nozzles, which are in general machined throughout. The rough castings are given a body finish by revolving in a tumbling barrel with steel shot and soapy water. After rinsing, the parts pass to hand operated turret lathes, fitted with air chucks, where the tail is squared to length and the male end and swivel are threaded. The parts then pass to inspection tables, and after inspection are trucked to the assembly station.

The expansion ring couplings are machine finished throughout, and much of this work is done on semi-automatic turret lathes, although hand operated lathes are used as required to fill the scheduled orders. The half coupling with male thread passes through the following steps. The thread is cut with a die in the first operation; then the body is faced and recessed. The part is then finished by grinding followed by a rough polish, and again by a finish polish. Grinding is done with cloth wheels with emery as an abrasive. Polishing is done with cloth wheels with tripoli as the abrasive.

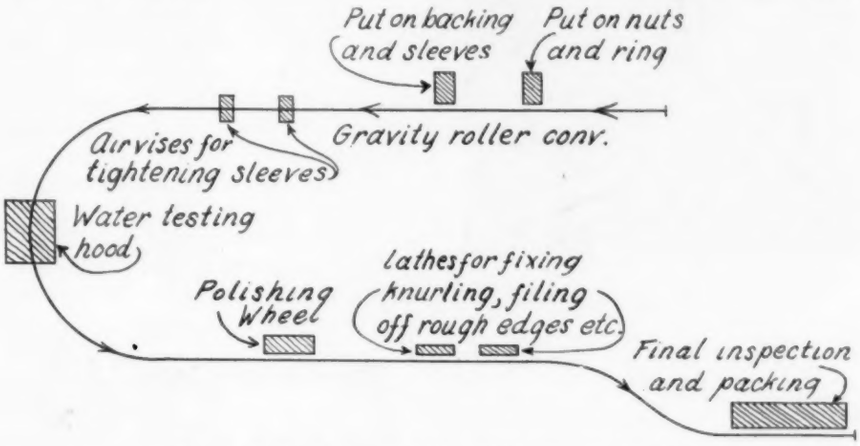


Fig. 2. Roller Conveyor Assembly Line for Nozzles

Fig. 3. Cleaning dross from crucible after melting

The swivel passes through three steps. The part is faced and recessed in the first operation, and in the second operation the other part is faced and recessed. The swivel end passes to a disc grinder for smoothing and then is rough polished, after which the lugs on the swivel are milled and the part passed to final polishing.

The half coupling which engages with the swivel is turned to receive the swivel and is then faced and recessed on one end. After machining the part is ground smooth and polished. This half coupling is then assembled with the swivel by expanding in an arbor press. The assembly of the swivel and half coupling, termed the binder, forms the female thread part of the coupling. This assembly is chucked in a lathe and the interior or waterway is recessed and the binder is then faced to dimensions. The part then passes to a disc wheel for final polishing, after which a serial number is stamped on the part, which is sent to the inspection table.

The nozzle parts require a number of machine operations before assembly. The spindle, which is cast brass, is tapped and recessed on a turret lathe without automatic attachments. The next six operations required to finish the spindle are done on a semi-auto-

Fig. 4. Pouring from monorail

matic lathe, which is fed by the operator who takes off a finished spindle at each turn of the turret and replaces with a blank spindle.

The sleeve, or body, is made in six operations on a full automatic turret lathe, which is fed with bar stock, six pieces at a time. The nut is also made on full automatic turret lathe from bar stock, with operations in progress on six pieces at a time.

After machining the nozzle parts pass to a gravity roller conveyor where the assembly of the nozzle is done in successive steps. At the first station the spindle is fitted with the nut and a split ring. The assembled spindle passes to the second station where the packing is inserted and the spindle is screwed into the sleeve hand tight. At the next station the sleeve is tightened with a special wrench while the part is held in an air vise.

The assembled nozzle now passes to the next station where it is tested under hydraulic pressure and then passes to final polishing. After polishing, the nozzle is inspected again and is then packed for shipment.

Special orders which call for nickel finish are plated by the "still tank" process in a well equipped room set apart for this purpose and equipped with a low voltage electric generator.

The foundry and machine shop are designed so as to secure an orderly

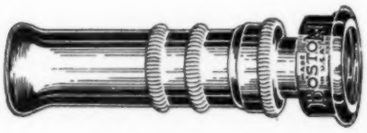


Fig. 6. Nozzle

and economical flow of production. Machines are used whenever hand work is not economical. Automatic and semi-automatic machines are used as far as the process will permit. Mechanical handling of materials in process is done so far as possible with a view to eliminating fatigue of operators. Ample room is provided for operators and machinery, as well as for storage of parts in progress. Particular attention has been given to the comfort of the operators, especially

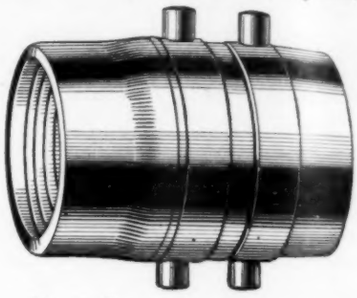


Fig. 7. Expansion ring coupling

on the point of lighting and ventilation.

The Boston Woven Hose and Rubber Company has made every effort to secure a high quality product in the brass accessories which are used with the hose made by the company. The well equipped foundry and machine shop enables the company to accom-

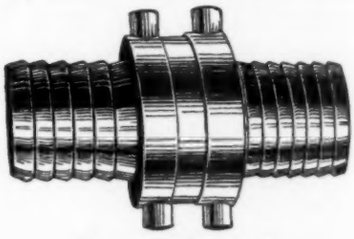


Fig. 8. Tail coupling

plish this purpose with the resultant economy in the manufacture of these parts.

Fig. 5. General view of machine shop

Smelting Tin Dross

Q.—We have a problem in running tin dross containing some iron.

The iron slags off and takes with it a considerable amount of the metallic tin, and we wish to find a flux with which we could flux the iron off as slag without drawing out any tin with the iron.

A.—We suggest that you try a flux composed of

Iron scale	100 lbs.
Lime	50 lbs.
Coal dust	200 lbs.
Silica sand	75 lbs.
Soda ash	15 lbs.
Fluorspar	50 lbs.

Mix this material up well and add 20% of the flux. The iron will throw down the tin and lead and flux off nicely the slag. If the slag shows any tin, increase the iron content. This will help to eliminate tin and lead from your slag.

—W. J. Reardon.

Purchasing Procedure; Stock Record Control for Metal Manufacturing Plants

A sound, practical method involving minimum clerical expense and no red tape. The control consists of five printed forms, a two-post binder, and a two-drawer 4" x 6" filing cabinet.

By CHAS. W. HARDY
Industrial Consultant, New York City.

Stock Record

AFTER stock record forms are procured, get an actual inventory of your raw materials, supplies, and parts and issue a stock record (Form No. 2) to cover for each item. You may want to start raw materials first and later get the supplies and parts and this will be action in the right direction. Keep the stock in an orderly condition and number the bins, boxes, shelves etc., before taking inventory. Show the location on the inventory ticket, also the correct description of the stock, and transcribe this and all other data to the Stock Record Form. When making the first entry, show on the top line of the Stock Record "Inventory as of ......" and under the caption "On Hand," post the amount. For methods used to take Inventory, see the December, 1935 issue of METAL INDUSTRY *"How to take an Inventory Accurately and Quickly."*

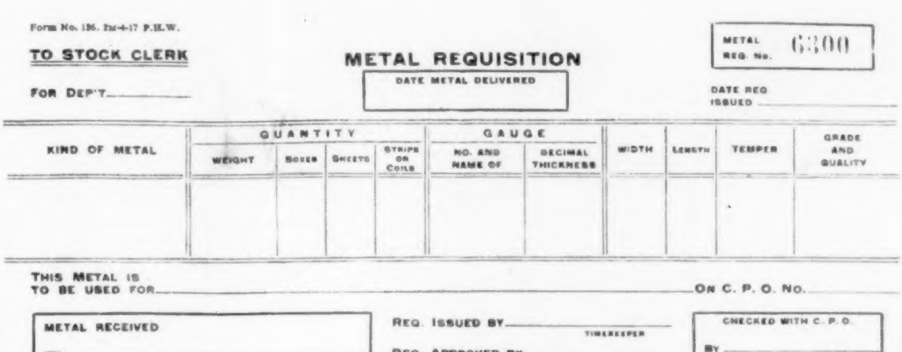
After stock record sheets have been issued for all items on hand, they should be classified and filed in a two-post binder. It is important to index the sheets so that they can be located easily and quickly. A typical index for the "Supplies" binder is as follows: Belts, Buffs, Brushes, Chemicals, Die Dep't Supplies, Enamels & Paints, Lacquer and Thinners, Oils, Paper & Twine, Printing & Stationery, Tripoli-Lime & Rouge, Soldering Supplies, Wipers & Waste, Miscellaneous. Use good judgment in making the index to fit your needs. Your stationery supplier will furnish sheets for this purpose with tags already applied or you can purchase the tabs in strip form and cut to the length needed and then attached in proper place on the index sheet.


MIN. 15,000 Pcs.
BIN L 606
UNIT PIECES
NAME #22 Brass Pocket Rivets - Nickel Plated 5/28/33.
USED FOR
ORDERED: DATE | PUR. NO. | FROM | PRICE | QUANT.
RECEIVED: DATE | QUANT. | DUE
DELIVERED: DATE | QUANT. | ON HAND
DELIVERED: DATE | QUANT. | ON HAND
DELIVERED: DATE | QUANT. | ON HAND
STOCK RECORD

Stock Record Form 2. (For data on reverse side see p. 443).

Departmental Requisition and Receipt

Instruction must be given directly after Inventory, that *nothing whatsoever* is to be issued to anyone *without* a Departmental Requisition and Receipt (Form No. 3) (see page 442) which is to be properly signed to cover the withdrawal of the material from stock. It must be signed by the person


Form No. 126. 2M-4-17 P.H.W.
TO STOCK CLERK
FOR DEP'T
METAL REQUISITION
DATE METAL DELIVERED
METAL REQ. No. 6300
DATE REQ ISSUED

KIND OF METAL	QUANTITY				GAUGE		WIDTH	LENGTH	TEMPER	GRADE AND QUALITY
	WEIGHT	BOXES	SHEETS	STRIPS OR COILS	NO. AND NAME OF	DECIMAL THICKNESS				

THIS METAL IS TO BE USED FOR ____ ON C. P. O. No. ____
METAL RECEIVED BY ____
REQ. ISSUED BY ____ TIMEKEEPER
REQ. APPROVED BY ____ FOREMAN
CHECKED WITH C. P. O. BY ____ STOCK CLERK

Requisition for Metal

issuing; also by the party who receives the material. These requisitions should be numbered and a void or a copy issued in error should *NOT* be destroyed. Every one must be received by the party who is to keep the stock records.


DEPARTMENTAL REQUISITION

Req. No. 12301

DESCRIPTION

Form 3. Departmental Requisition.

At the end of each day, these requisitions are accumulated and delivered to this person and he or she will post and deduct the amount of items taken from stock, calculating and showing the balance left. When they are posted, the requisitions should be filed according to the date shown thereon for further reference, in a convenient box or filing cabinet. Besides this a record should be kept to be sure that each and every requisition is accounted for.

Purchase Order

To be made in triplicate. Original to Vendor, duplicate to Receiving Clerk, triplicate remains in Purchasing Dept. or office. From the triplicate post the necessary information to the right stock record form.

It is advisable to keep all open (not completed) purchase orders in a file and post thereto the shipment and show balance due (see reverse side of Purchase Department's Copy on p. —). When completed it should be filed in another file either according to Vendor's name or the Purchase Order Number. Always show as much description and information on the Purchase Order as you possibly can. Try in every case to show price to avoid misunderstandings.

PURCHASING DEPT.'S COPY OF PURCHASE ORDER

7752

DATE
REQ. NO. DEPT.
F. O. B. TERMS

DELIVERY REQUIRED

(Write here. More space on actual copy, condensed here for lack of space.—Ed.)

Released or Promised (Back of copy)

DATE	QUANTITY	REFERENCE

RECEIVING DEPT.'S COPY OF PURCHASE ORDER

7752

DATE DEPT.
REQ. NO. TERMS
F. O. B.

DELIVERY REQUIRED

(Write here. More space on actual copy, condensed here for lack of space.—Ed.)

Receiving Record (Back of copy)

DATE	RECEIVING RECORD NO.	QUANTITY	BALANCE DUE

Form No. 4. Purchasing Dept. Copy and Receiving Dept. Copy of Purchase Order

Receiving Records

This (Form No. 4) is issued by the person who receives your deliveries.

PURCHASE ORDER

7752

DATE
REQ. NO. DEPT.
F. O. B. TERMS

DELIVERY REQUIRED

QUANTITY	SPECIFICATIONS	PRICE

(Write here. More space on actual copy, condensed here for lack of space.—Ed.)

SUBJECT TO CONDITIONS ON BOTH SIDES

FORM 137 3M 4-34 ST. (OVER)

You may be using a form or book that will answer without changing; but I shall assume you are going to use this form. A copy will be sent to the person keeping the stock records, who will enter the necessary information, and retain the same to be attached to the vendor's invoice for the purchase after the quantity received checks with the quantity charged for. Then the invoice can be passed for payment after checking price, extension and total. The quantity will be added to the "On Hand" amount.

The Stock Record will now show the following:—

See the complete record of your purchase order, date of order, purchase order number, vendor's name, price, quantity ordered; then the history of the vendor's shipments and the quantity still due. Overshipments should be shown in red in the due column. The price if not shown on the purchase

order, is entered at the time the vendor's invoice is checked, and a good practice is to place a dot opposite the quantity received which will prevent passing an invoice twice for the same delivery. You can also discover a change in price, or if the vendor made a mistake in the price on subsequent shipments. This price information is of great help when pricing at inventory time and also for compiling estimates and cost data.

Minimum Quantity for Stock

This is the quantity that should be carried on hand and when reached, another purchase order should be placed. A good basis to use for establishing this minimum, is to consider how much you use and how long it generally takes to get. Minimums are variable and therefore should be changed according to business conditions. In making a revision, always show the date the minimum was changed.

Unit of Quantity

This is important. Generally use the unit of quantity that is standard with the one quoted by the vendor. Screw machine parts, for example are practically always quoted per 1000 (M) pieces; brass by the pound; buffs by the 100 sections; chemicals by ounce, pound and gallon.

CONSUMPTION. UNIT Pieces

MONTH	1932	1933	193	193	193	193
JAN.	5000	13,000				
FEB.	3000	6,000				
MARCH	None	53,350				
APRIL	"	37,000				
MAY	"	43,600				
JUNE	"	55,000				
JULY	"					
AUG.	"					
SEPT.	2000					
OCT.	10,000					
NOV.	None					
DEC.	2000					
TOTAL	22,000					

SKETCH OR SPECIFICATION

PRICE CHANGES

DATE	12-16-32	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]						
PRICE	2.10	1.95	1.65	1.50	1.15	N.P. 1.35	N.P. .90						

QUOTATIONS

REFER CODE	REFER DATE 1933	VENDOR	DEL'D	LOTS OF 25M	50M	100M	200M	START DELY DAYS	REFER CODE	REFER DATE	VENDOR	DEL'D	LOTS OF				START DELY DAYS
L	2-1	[illegible]	[illegible]	1.47	1.22	1.07	.97	3									
L	2-1	American Hinge	"	1.50	1.50	1.50	1.50	1									
L	2-1	Waterville Mfg.	[illegible]	1.15	1.10	1.00	.95	4									
L	2-1	[illegible]	"	1.08		1.05	[illegible]	7									
Q	2-2	[illegible] & Co.	"	1.60	[illegible]	1.35	[illegible]	14									
L	6-28	[illegible]	[illegible]		N.P. 1.98		N.P. 1.85	21									
Q	6-28	Cornwall & Patterson	[illegible]		N.P. 1.05	N.P. 1.00	N.P. .90	7									

Reverse side of Stock Record Form 2 shown on p. 441

"Used For"

Good practice, especially when recording raw materials or parts. This data can be gradually added and the information can be obtained from the requisition when posting the withdrawal of same from stock.

Note the space on reverse side of the Stock Record (Form No. 2) for sketch. This is advisable on parts, particularly those purchased. Show a dimension drawing, not necessarily to scale. Tolerance should be noted, the same as those given to the vendor for further reference.

Quotations

Enter all prices received. Code is for the source of the quotation. You will find the following code practical:

V—Verbal
P—'Phone
L—Letter
T—Telegram

"delivered" is the F.O.B. point. Use the word yes or no.

Consumption

This represents the addition of the entries on the face of the form and if kept correctly, the yearly total figures are sufficient. The detailed or monthly requirements can always be readily found if needed.

ACCOUNTING DEPT'S COPY

№ 6952

RECEIVING RECORD

RECEIVED FROM

PURCHASE ORDER NO. DEL. BY PKGS. CASES BUNDLES CHARGES $ DATE REC'D. 193

DESCRIPTION	Code	QUANTITY	UNIT

ENTERED IN STOCK RECORDS

CODE
D—DELIVERED
S—PUT IN STOCK

FORM

Accounting Dept.'s copy of Receiving Record

GENERAL CONDITIONS

Invoices

Will be mailed not later than the day following the date of shipment, together with a Bill of Lading or other shipping documents.

Statements

An itemized statement of account at the end of each month is required. A delay in rendering the statement will be considered just cause for withholding payment without loss of discount.

Packing

Our order number must appear on the outside of each package or container, and a packing slip enumerating the contents should be included within each package.

Charges

No charges will be allowed for boxing, packing, cartage or insurance. Freight or express charges must be prepaid if terms are f. o. b. destination.

Deliveries

It is agreed that time is the essence of this contract, and the right is reserved to cancel the order if deliveries are not made within the time specified.

Quality

The seller warrants that material, work or merchandise applying on this order shall conform to specifications, drawings, samples or other description furnished or adopted by us, and shall be fit and serviceable for the purpose intended, and free from defect. Goods which are found to be defective will be returned and charged on our debit voucher, together with all transportation charges paid by us.

Assent

The acceptance of this order constitutes an agreement to the foregoing conditions and to the terms and specifications on the face of the order.

Reverse side of Purchase Order (shown on page 442).

Method to Use in Getting Quotations

For example, we shall use part No. 9306 Brass Bushing. This particular part is made on an automatic screw machine and generally buyers of these parts know at least five or six of the companies they prefer doing business with. If you do not, consult the telephone directory, METAL INDUSTRY and other publications pertaining to our industry. Thomas' Directory is very good; also the cards left by the salesmen calling on you.

It is always well to get quotations first on the parts of which you buy the most. Get six samples and give the list to the stenographer to send. It is not necessary to write a letter; use a small envelope and just fill in the necessary data.

REQUEST FOR QUOTATION

Name _____

Quantity _____

Remarks _____

ALL QUOTATIONS IN WRITING UNLESS OTHERWISE REQUESTED.

Request for Quotation

Show on the Receiving Department's copy of the Purchase Order. "When received, send six pieces to office for quotations." This is done on the first order for a particular part. This serves to check the supplier's price if the order is given to him without a price. An order without a price shown thereon is usually issued when the quantity is small and needed in a rush and you cannot wait to get prices on the part.

A good buyer can get automatic screw machine parts at the right price within two or three days although it sometimes takes Purchasing Agents longer than this to get prices. This "knack" is learned only by experience. Revise the list of names of those to quote by dropping the company that is always too high and too long on delivery and supersede with one or two new vendors.

Filing Business Cards

Get 25 plain three cut Index Cards —4" x 6"—and a set of the alphabet. On the plain cards, print the major raw materials, supplies, and parts you buy such as: Brass, Chemicals, Eyelets, Lacquers, Pins, Rivets etc., and then as the salesman leaves his card, show the date thereon and file under the commodity. The set with the alphabet is placed in the back and is used for miscellaneous commodities (those cards for which you do not have a specific index). This makes a very good buyer's guide after a few months accumulation. The top drawer of a desk is a good convenient place to keep them. They can be filed easily and referred to quickly when wanted.

Sources of Supply

After the records are in use for a short time the stock record form will show a complete record of the item and on the reverse side, those who have quoted prices, etc. An experienced buyer knows his sources of supply as well as he does the multiplication table. If he doesn't, he can find many ways to obtain lists of certain manufacturers and the addresses. Trade Publications are very good; they pertain to the specific industry you are interested in. Further, most of the publications carry a list of current prices and changes.

Request to Purchase

This Form (No. 1) is issued by those having authority to order and must be approved and given to the Purchasing Agent who in turn will place the order. The regular Purchase Order can be typed from the Request to Purchase form. These forms should be filed according to date where they can be referred to quickly. The paramount factor is the *Quantity Needed*. This is generally a guess (most times too high). Buy less, order more often is a sounder policy. Also do you really need it? Is there nothing on hand that can be substituted, especially when ordering raw materials? Watch this factor. Common sense coupled with a willingness to try a small quantity of some item of raw material on hand will often prove very profitable and help reduce stock that is slow moving.

Rush Orders and Follow Up

A little "kink" the writer has used for years is helpful. It is just a regular penny post card printed as follows:

ACTION

OUR ORDER NUMBER _____

ANSWER!

WHEN WILL YOU SHIP? WRITE · TELEGRAPH · TELEPHONE

Rush card to the supplier

When the card is sent, a notation is made on the copy of the purchase order on file in the Purchasing Department showing date mailed and when delivery date is obtained it is also entered on the Purchasing Dept.'s Copy of the Purchase Order, also on Purchase Schedule Chart if one is to be kept.

Purchase Schedule Chart

A chart, inexpensive, like the picture on p. 445, is very effective and simple in operation. It can be purchased complete if you do not care to make it. The different colored tacks placed where they belong tell the story. It is

REQUEST TO PURCHASE

DATE _____

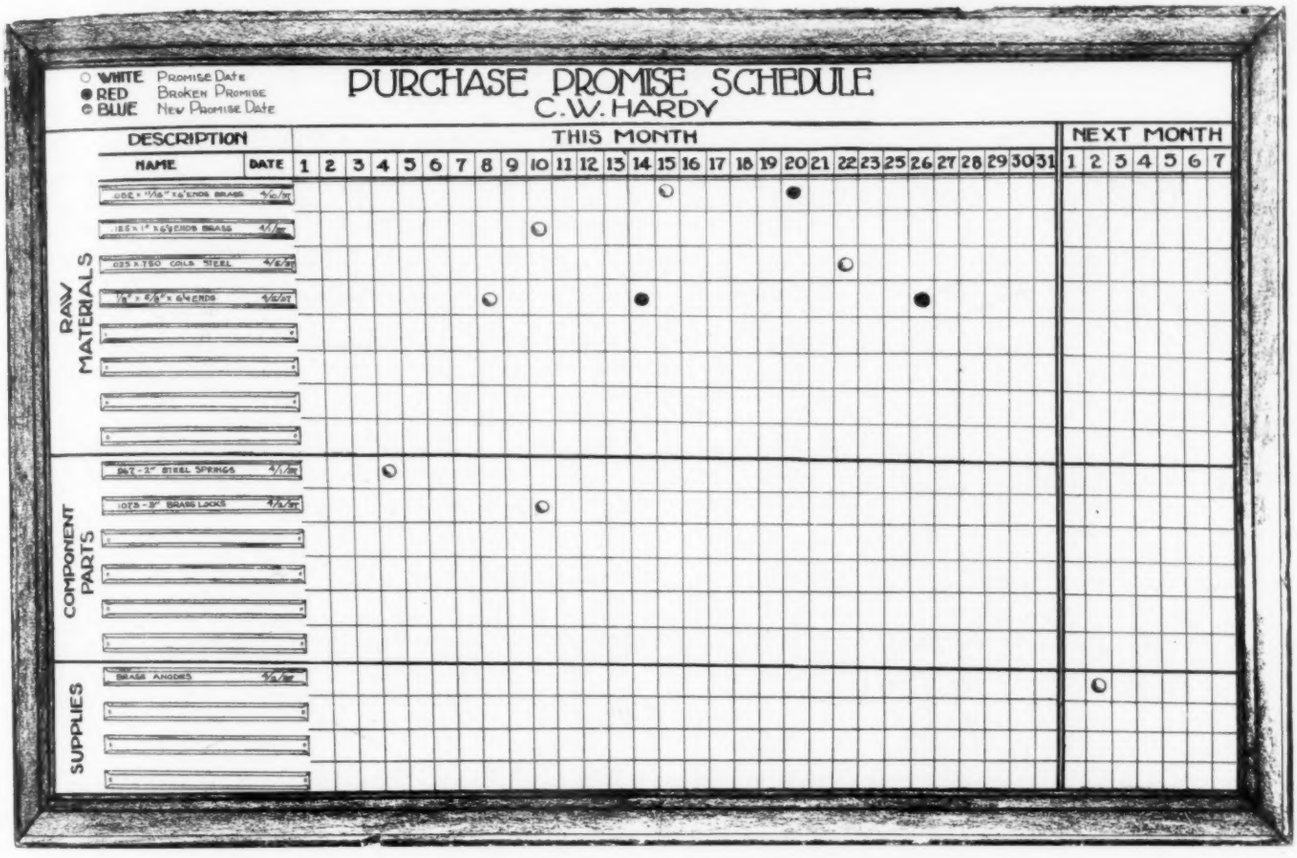
QUANTITY AMOUNT	QUANTITY UNIT	DESCRIPTION	DATE WANTED	TO BE USED FOR	PRICE	VENDOR

APPROVED BY _____ ORDERED BY _____

Form No. 1. Request for the P. A. to purchase.

easily understood by all having use for the information, saves a lot of unnecessary conversation and misunderstanding. The results are quick when anyone wants to know "when such and such will be delivered."

Note: the date the material is to be *delivered* is used and not the date the vendor will ship. It is the Purchasing Agent's assignment to watch daily, all due dates and to follow up those delinquent.



Purchase Schedule Chart

Surface Holes in Castings

Q.—We are sending under separate cover a sample casting which has been rejected for holes in the surface. We should appreciate your comments concerning this defect and any suggestions you have to offer for its elimination.

This type of defect, which is found on a number of different shaped castings, occurs spasmodically. Sometimes for a period of time it is entirely missing; then reappearing, and it will be found on 5% to 20% of the castings. The location of the defect on each type of casting is not fixed, shifting around from place to place. The mixture is 84% copper, 9% zinc, 6% lead and 1% tin, melted from new metal plus gates and turnings in coke-fired crucible furnaces, using 1 oz. phosphor-copper per 200 lb. of metal, poured at 2050 to 2100 deg. F. Albany sand is used, of quality recommended for the type of work we are doing, and riddled through an eccentric rotary riddle. A relatively small quantity of sand is kept in circulation so that after the first pouring the sand is usually quite warm.

A.—On examination of the sample defective bath faucet casting, we are of the opinion this defect is caused by gas generated from the molding sand or core. The gas cannot escape fast enough and is trapped in the high part of the mold and is mixed with the metal, making it spongy.

You admit that after the first pouring the sand is usually quite warm. This will at times, due to the humidity, cause steam and moisten the core. When the hot metal comes in contact with the core, it will cause gas.

The remedy is to aerate your sand. There are a number of such machines on the market which screen, cut, and aerate your sand so that it is cool and fluffy, all in one operation. There is also a moisture meter for taking moisture readings that has proved very useful in sand control.

We believe a great deal in sand control. In your class of work we are of the opinion that proper aerating of the sand and control of moisture will pay large dividends on the investment.

If not in position to control sand, the remedy would be to use a more open sand and ventilate any part of the mold that might trap air or gas. Gas given off by the core will cause similar defects if the mold is not ventilated.

At any rate, we believe the defect as shown on sample casting is due to gas generated from the molding sand or core. We see nothing wrong with the metal. —W. J. Reardon.

Metal Cleaning-Principles and Practice

A series of articles describing the preparation of chemically clean surfaces on metal products before plating and finishing operations. Conclusion*.

By **DR. C. B. F. YOUNG**

Consultant; Instructor, Columbia University; Lecturer, New York University.

IN THREE earlier articles* the author described the different methods of cleaning metals for plating operations. The present article is a continuation of this series dealing with certain applications.

Washing and Drying Apparatus

There has always been a need for washing certain materials and as long as clean surfaces are a prerequisite to good finishes, the demand will remain. It is advantageous to use a continuous washer on certain types of work. This is especially true where large tonnage is handled and the foreign material is present in such a manner that it can be removed by submersion in and spraying with the aqueous cleaning liquid. Such work can be cleaned automatically. In order to prevent any kind of staining, the material is generally heated in the process so that on emerging from such a treatment it will dry from its own heat. This drying process is especially desirable if there is to be at any time a chance for a holdover which would permit the slow drying of the material, resulting in stains.

A conveyor type continuous washer is shown in Fig. 1. The complete cycle involves five processes, namely; washing, draining, rinsing, then draining and drying. A conveyor carries the work through each process. Perforated pipes extending from the sides of the machine spray hot cleaning compound and rinse water on the material being treated from two different directions, above and below. After the rinsing, the material is subjected to a blast of hot air from slatted pipes which are located above and below the conveyor. The air is circulated through a unit steam coil in the base for reheating. In order to prevent saturation of the air surrounding the work, a predetermined amount is admitted, thus assuring at all times a quick complete drying.

The conveyor is adapted to the material being handled. These may be coarse belts supported by chains for large work, or flexible mesh belts running over drums for small material. If parts are difficult to clean, conveyors can be had with fixtures for handling this difficult work. The conveyor belt is supported by and runs on a track. Being continuous, it returns through a housing which prevents any loss of solution.

If parts are composed of light

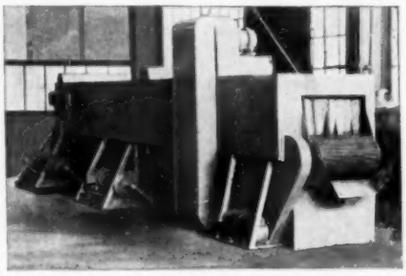


Fig. 1. *Conveyor type continuous washer. (Courtesy N. Ransohoff, Inc.)*

stampings which are too light to dry from their own heat, a continuous washer and dryer may be used in which the material being cleaned is dried by a continuous blast of hot air blown on the work through a slot in a pipe extending down the center of the screen and circulated through a unit steam coil in the base.

Machines are built for water or soap, rolling or pickling, and if built of acid resisting materials may be used in a wash-rinse-pickle rinse series which prepares the work for plating. Of course, this being the batch method, the work is held in the drum as long as necessary so that thorough cleaning results. The speed of the barrel can be decreased for cleaning delicate work and increased for cleaning other work. The parts are placed in the barrel and run in the tumbling direction until finished. A stream of water or soap solution is pumped onto the work to insure proper lubrication, from a steam heated tank located beneath the barrel. This also aids in removing grease and the products of tumbling. When the tumbling operation is complete, the direction of rotation of the drum is reversed and the work is automatically discharged. Upon removal, the work is drained and rinsed on the draining screen. This automatic unloading barrel may be equipped with a power loader in which case the labor involved in handling the work is negligible.

In the last two years a definite increase in the use of zinc plating has taken place. This is due to the fact that this metal is being substituted for cadmium because of its cheapness. Cadmium has about doubled in price due to its increased use as an alloying agent in the manufacture of bearings for automobile engines. Zinc can be deposited as easily as cadmium, but due to its position in the electrochemical series is more reactive and for that reason will stain if not thoroughly dried after plating. This paper has previously dealt only with cleaning processes which take place before plating, but this phase is so important that it will be discussed at this point.

It is possible to dry this material by hot air blast. The apparatus is a combination rinsing and drying unit. The work is charged into a drum through a hopper. The machine consists of a submerged perforated cylin-

*Parts 1, 2 and 3 were published in Abrasive and Cleaning Methods for Nov. 1936, January and February, 1937.

der rotating in hot water, which gently agitates the work in water, producing a hot rinse. It is then fed at a predetermined rate into a drying screen

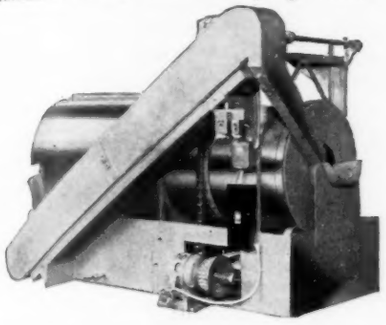


Fig. 2. Dryer and sawdust polisher. (Courtesy N. Ransohoff, Inc.)

attached to a screen. In the first two feet of the screen, the work is screened and in the remainder it is subjected to a hot air blast, the air being drawn through a unit-type heating coil and blown onto the work through a slot into a longitudinal pipe extending through the center of the screen. The work leaves the machine completely rinsed and dried. If necessary this apparatus can be built with two drums in series giving first a cold and then a hot rinse.

One of the best methods of drying plated material is by tumbling the work in sawdust. In Figure 2 is shown a unit that not only dries but also sawdust polishes work. During the rotating operation a screen located in the tumbling compartment permits a definite amount of sawdust to escape to a steam heated conveyor where it is dried and then returned to the tumbler. In this way hot dry sawdust is assured during the operation. When the batch is finished, the rotating direction is reversed which discharges the load. The sawdust is automatically separated in the discharge screens and returned via the steam heated conveyor to the barrel. This unit eliminates all labor in connection with the handling and drying of sawdust. It is also built in a continuous type in which the work passes directly through the drum and a stream of hot, dry sawdust is circulated through the drum at the same time. This is used where only sawdust drying is required and not additional sawdust polishing.

Some interesting equipment can be obtained by combining some of the above types resulting in the elimination of a large part of labor which is so costly. It must be borne in mind, however, that the capital invested is much higher than in manually operated machines which results in a higher interest charge. As a general rule, however, the labor charge is the biggest single item and any reduction here will result in savings. Shown in Figure 3 is an interesting installation which was installed in the plant of a novelty manufacturer and resulted in the elimination of 60% of the labor originally required. The equipment consists of two parts, the first a ball separator, washing and rinsing machine and second a continuous sawdust dryer. The work and balls are dumped from the burnishing barrels directly into the screen bottom buggies; constructed so as to aid draining of the burnishing soapy waters. These are located under burnishing barrels, and as the contents are emptied into these buggies, they are rolled out and lifted by a monorail hoist and the contents dumped into the first unit. Here the work and balls are washed, rinsed, and separated, the balls being discharged into a buggy located on the floor beside the machine and returned to the burnishing barrels. The work passes on to the sawdust dryer.

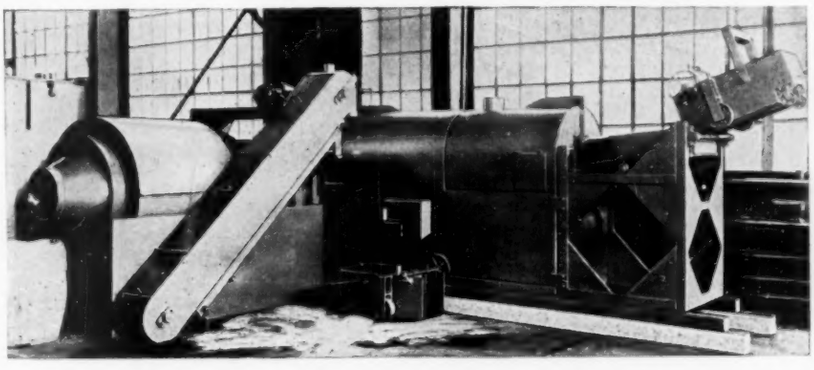


Fig. 3. Combination washing, rinsing and ball separating machine, together with sawdust dryer. (Courtesy N. Ransohoff, Inc.)

Figure 4 shows a combination drum and conveyor type washing, rinsing and drying machine. The drum type produces a soaking wash followed by the conveyor which gives a spray wash, resulting in loosening the dirt and then removing it.

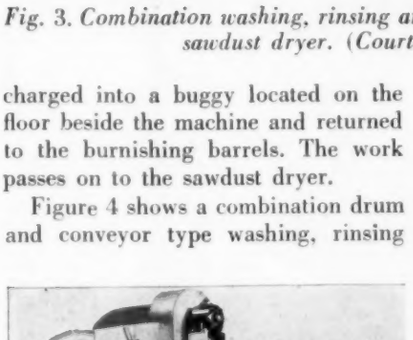


Fig. 4. Combination drum and conveyor type washing, rinsing and drying machine. (Courtesy N. Ransohoff, Inc.)

When the subject of drying arises, one always thinks of the centrifugal type (Figure 5) which has been a favorite of many for years. This type of apparatus has proven its value in the drying and lacquering of certain types of work. The apparatus has a height of 27″ from the floor to the top of basket cage and 30″ from the floor to the top of the outside cage, is driven by a V belt and requires a floor space of 78″ x 32″. The basket, 12″ x 12″, is constructed of steel woven mesh and steel frame. A ¾ H. P. motor turns the basket at 625 R. P. M. and is controlled by a reversing switch located on top of the enclosed driving mechanism. The whole apparatus is mounted on a steel base and is arc welded at all points to insure rigid construction. The water removed from the work is drained through outlet plugs located in the cage bottom.

Fig. 5. Centrifugal type drier. (Courtesy Dellinger Mfg. Co.)

Degreasing

The success of cleaning by solvents is due to the liquid used forming a homogeneous mixture with the material which is to be removed and the solution thus formed running off the object, leaving behind a clean surface. Solvent cleaning in the past had the

disadvantage of early contamination of the cleaning medium which resulted in poor cleaning. This has been rectified by cleaning in the vapor state. The cleaning is produced by heating low boiling organic chlorinated compounds until their vapors fill a compartment. The cool object to be cleaned is introduced into these vapors and condensation immediately takes place. As more and more liquid is formed, grease and oil is dissolved and flushed from the surfaces. The degreaser consists of two parts, the first a heating chamber and the second a vapor chamber. In order to make the process economical the upper portion of the vapor chamber contains water cooled surfaces so that any vapor rising above a certain height will be condensed to the liquid state and then prevented from escape to the atmosphere and being lost.

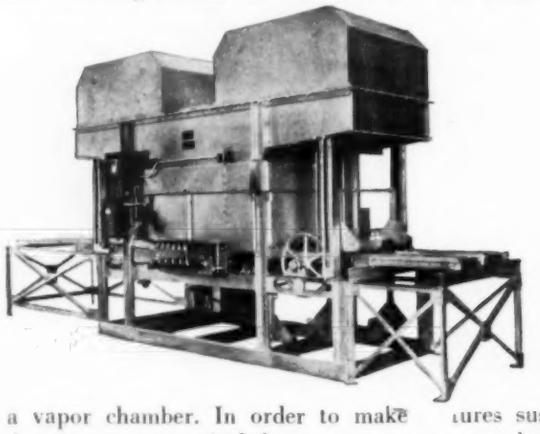


Fig. 6. Automatic vapor-type degreaser used for the production cleaning of heavy gauge metal parts. (Courtesy Detroit Rex Products Co.)

Losses result from the following:

1. Diffusion.
2. Poor design.
3. Low heat input.
4. Human element.
5. Type of machine used; (liquid phase, vapor phase, combination, etc.)
6. "Drag-out."
7. Cost of solvent.
8. Cost of heat.
9. Decomposition of solvent due to misuse.
10. Cost of redistillation, if used.

As has been pointed out in an earlier article, there are different types of degreasers but they can all be classified as follows:

1. Vapor phase.
2A. Liquid immersion.
2B. Liquid Spray.
3. Combination of 1 and 2.

Vapor phase cleaning is the simplest and has the lowest possible cleaning cost, provided it can be properly adapted to the work. It is not suitable for cleaning objects having a large area per unit of weight. All parts should be 18-20 gauge or even heavier.

If the volume of work justifies it, any type of degreaser can be made completely automatic by properly applying suitable conveyors and temperature control equipment. Fig. 6 shows an automatic conveyorized, vapor type degreaser which is used for the simple cleaning of oil or grease from heavy gauge metal parts. This machine is equipped with a two strand cross-rod type of conveyor, which has a variable speed drive. Special fixtures suspended from the chain conveyor handle the work baskets through the degreaser. Roller-type gravity conveyors at each end of the machine provide automatic loading and unloading.

Electric immersion heaters, and thermostatically controlled magnetic relay and line switch are used. The machine is also equipped with a full automatic vapor level control device.

This model is built in various sizes according to the specifications desired. The particular machine shown is 20 ft. long, 6 ft., 3 in. wide by 9 ft. 8 in. high. It has a rated production capacity of over 6,000 lbs. of heavy gauge metal parts per hour at low conveyor speed.

Parts are received on the gravity roller conveyor loaded in grill-type metal basket having perforated plate separators. These work baskets are automatically lifted from the conveyor fixtures and carried through the machine and subjected to vapor cleaning in the pure solvent vapor. The baskets of work on being conveyed out the opposite end of the machine are automatically transferred onto the gravity rolls at the exit end. The complete cycle of vapor cleaning requires only about four and one half minutes.

Liquid Immersion Degreasing

When vapor degreasing is not practical, as in the case of cleaning light gauge metal, liquid immersion is generally used to remove large parts of oil or grease and solid materials. The cleanliness obtained depends upon the purity of the solvent. This is accomplished by first dipping the articles in a boiling solution, then immersing the materials to be cleaned in a second tank containing practically pure solvent which is obtained by continuous distillation. It is also possible to use two rinse tanks so that contamination is reduced to a minimum. These types are called two or three liquid immersion processes. Instead of using all liquid immersion, it is possible to substitute a spray which is very effective in loosening foreign materials which will not be dissolved off easily.

Fig. 7 is a three dip machine which cleans parts that have a tendency to nest and touch each other, parts having a large quantity of oil and pieces fabricated from very light gauge metal which cannot be cleaned satisfactorily in the vapor or the liquid vapor machines. After the parts are washed in the boiling solvent they are then rinsed in the middle compartment, which chills them ten to fifteen degrees to insure a thorough vapor rinse when placed in the third or final compartment. This model may also be operated as three hot liquids or as a liquid wash—vapor rinse with an additional tank provided for rust proofing of the parts just degreased. Judging from the above, it can be seen that such a degreaser is very flexible and can be used in a number of combinations.

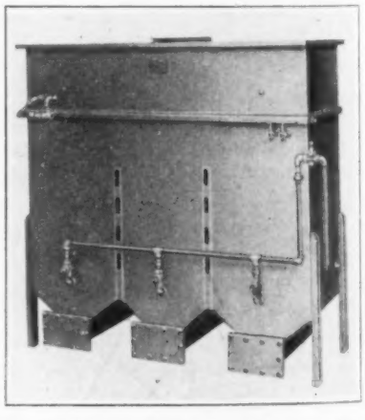


Fig. 7. Three dip degreasing machine. (Courtesy G. S. Blakeslee Co.)

Liquid Vapor Phase

The liquid vapor phase is the most popular of all degreasers as this type unites the advantages of both processes, producing results which would otherwise be lacking. The apparatus is less expensive than the two or three liquid type degreasers and a cleaner surface is obtained due to the vapor rinse. The machine is provided with suitable heating and condensing coils and overflow flanges are installed so that a still may be added later if necessary.

The operation of this degreaser consists of placing the material to be degreased in baskets or on hooks and then lowering into the liquid compartment where the excessive grease, dirt, dust and swarf is washed off. Care is taken to see that the temperature of the material being cleaned does not rise enough to become equal to that of the liquid. This is accomplished by determining the time of immersion. The articles are now removed from the liquid cleaner and placed in the adjoining vapor rinse compartment where they are allowed to remain until condensation ceases. Steam is the most efficient method of heating, while gas is second and electricity third. If electricity is used the machine should be insulated so as to economize on the amount of current used.

A cut away of a liquid-vapor degreaser is shown in Fig. 8. The work is first dipped in section 2 (see diagram) until most of the foreign material is removed; then removed to the vapor column and allowed to remain here until condensation practically ceases.

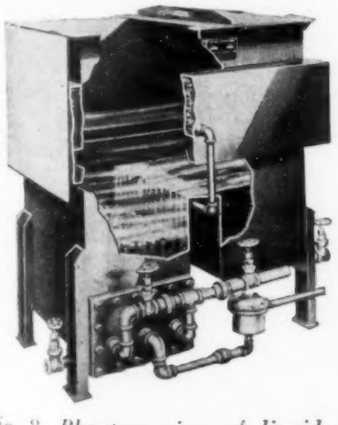


Fig. 8. Phantom view of liquid degreaser. (Courtesy Detroit Rex Products Co.)

Recovery Stills

In some cases it is advantageous to use a recovery still so that the solvent can be kept in a clean condition at all times. This is especially true if the contamination is very heavy. It must be kept in mind, however, that all degreasing machines are crude stills and if time permits, they can be used to distill and purify the solvent. Time being a factor, in many cases it pays to add a separate still to the degreasing unit.

Nearly all manufacturers of degreasers also produce stills. Some of these products are shown below. However, these are generally designed for the solvent, trichlorethylene. In some cases, a manufacturer may be using carbon tetrachloride, lacquer thinners, or petroleum hydrocarbons and for that reason other types of stills are discussed in this paper.

Fig. 9 shows a degreaser completely equipped with a recovery still and storage tank. Incidentally this degreaser is one of the largest ever built, having a maximum capacity of 60,000 pounds per hour. These stills may be run continuously or intermittently. One manufacturer has standard solvent stills with capacities of 30-50 and 125 gallons of solvent per hour. These are built to operate on steam at fifteen pound pressure, and are combination standard—sparge type stills. The solvent is first vaporized in the continuous still until a temperature of 220° F is reached; then the addition of solvent is stopped. The increase in temperature of the solution is due to the increase of concentration of contamination. At this point steam is injected and the remaining portion of solvent is recovered.

The batch type still is operated up to a temperature of 220° F and then steam is injected for twenty-five minutes, thereby reclaiming all the solvent. These stills are fully equipped with a water separator and all necessary instruments.

Fig. 10 is a diagram showing the operation of a recovery still. The cost

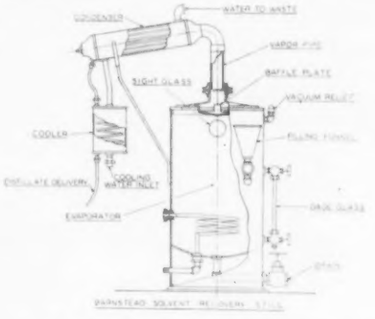


Fig. 10. Diagram of distilling apparatus. (Courtesy Barnstead Still & Sterilize Co.)

of operation of stills will depend upon the solvent to be recovered and the method of heating, but according to a leading manufacturer, the recovery cost will be less than one cent per gallon, which is the complete cost of operation. The life of the still is gen-

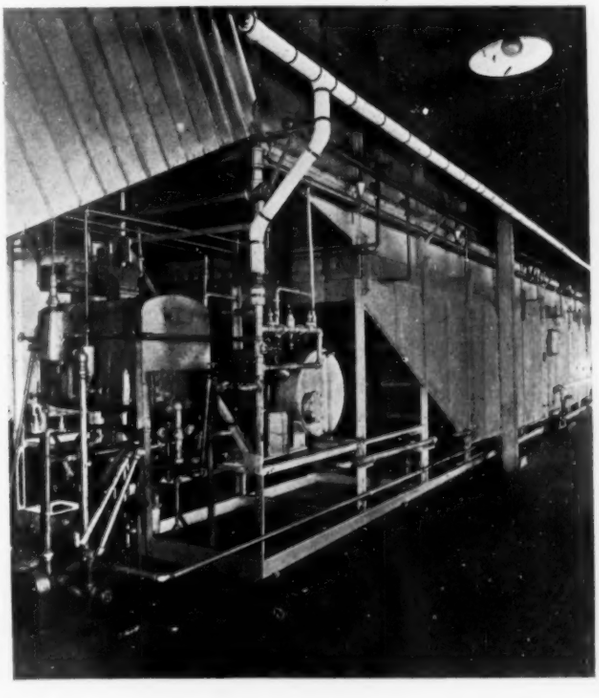


Fig. 9. Degreaser equipped with recovery still and storage tank. (Courtesy Detroit Rex Products Co.)

erally ten to fifteen years and in some cases longer.

A twenty-five gallon still, electrically heated, is shown in Fig. 11. This apparatus is used to recover lacquer solvents and carbon tetrachloride for a large electrical manufacturing concern.

Solvent recovery stills can be obtained in almost any desired size to fill almost any requirements. If the solvent losses in any plant are high, it will pay the operator to investigate closely this type of apparatus.

In closing this series of articles, the writer wishes to thank these Companies who have so willingly given their time and information toward making the preparation of these papers possible.

Fig. 11. 25 *gallon recovery still. (Courtesy Barnstead Still & Sterilizer Co.)*

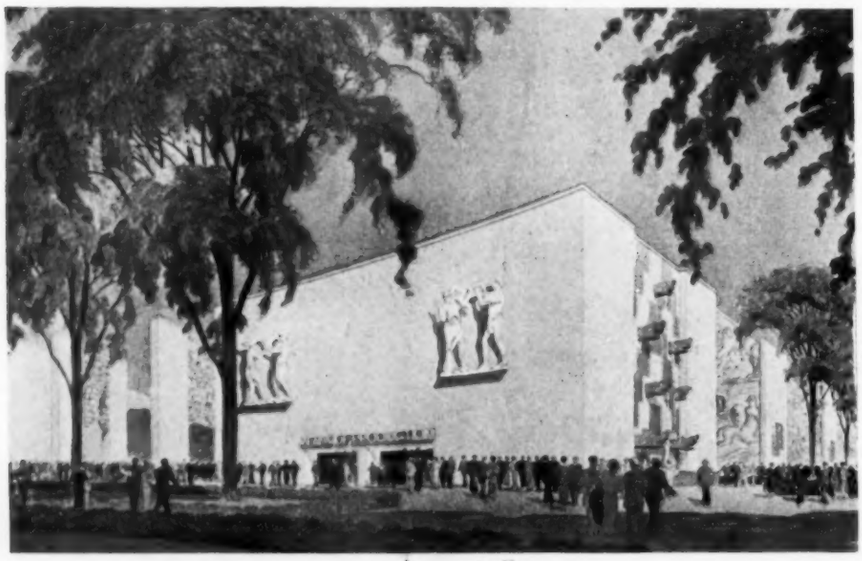
Metals at the World's Fair

METALS and metal products will be on parade at the New York World's Fair of 1939 in a new line-up and in more brilliant array than ever before.

The prominence of metals in the vast exhibit areas provided is expected, indeed, to be proportionate to the role these prime necessities play in present-day conveniences and delights and to their importance in the future. This is virtually inevitable, since the New York exposition is being erected about the theme "Building the World of Tomorrow," which might be the metal industry's own slogan.

Metals, according to the announcements, will be accorded exhibit in the outstanding Hall of Production. This structure occupies a prominent location in the Means of Production Zone, one of the largest of all the exposition's schematic zones.

The *American Telephone & Telegraph Company* has taken 139,400 square feet of ground at a contract price of $48,790. The *United States Steel Corporation* subsidiaries have signed a contract for 55,166 square feet of space. The *Westinghouse Electric and Manufacturing Company's* contract with the Fair calls for 10,922 square feet of floor space. Other firms that have taken large blocks of space are the *General Electric Company*, the *American Gas Association*, the *Consolidated Edison Company* and the *Johns-Manville Corporation.*



Where metals will be exhibited at the World's Fair

Brass for Marine Fittings

Q.—This unit is engaged in the construction of small lifeboats that have a considerable amount of brass fittings. Until recently we experienced no trouble in the casting of the brass fittings. During the past year the specifications for the boats have been changed, calling for most of the fittings to be made of naval brass, in strict accordance with Federal Specifications Board Specification No. 272. When the new specifications came out a considerable amount of naval brass ingots, in accordance with the Federal Specification No. 272, were purchased.

Upon attempting to make castings of the naval brass considerable trouble was experienced in shrinkage. Various methods were tried to overcome the shrinkage but with no success.

Information is requested whether or not it is the practice to make miscellaneous types of fittings for marine use of Naval brass, or is Naval brass suited for certain types of work only? We refer to small size castings. Information is also requested as to the proper heat to pour and handle Naval brass in the foundry.

A.—Specification No. 272 Naval brass is a yellow brass and is composed of 62.5% copper, 36.3 zinc, 1.0 tin, 0.2 aluminum.

This mixture is recommended by Bureau of Standards, for use for corrosion resisting castings where strength or bearing requirements are unimportant, such as valves, hand wheels, hand-rail fittings, chest hinges, etc., and where castings are not subjected to water or air pressure.

It is necessary to arrange your gates so that the metal is given a run before entering the castings, and make gates large enough to take up the shrinkage. The pouring temperature should be about 1850 deg. F. If handled properly, no trouble should be experienced as the metal runs well due to the aluminum, and the shrinkage is overcome by arranging the gates and risers to suit the work.

—W. J. Reardon.

Purifying Nickel Plating Solutions by Electrolysis

Simplicity, low cost and ease of accomplishment, compared with precipitation and filtration.

By DR. LOUIS WEISBERG
Louis Weisberg, Inc., New York City

PLATERS occasionally have the exasperating experience of making up nickel plating solutions at different times, using exactly the same formula, and getting strikingly different results. On one occasion the deposits may be good; while another time they may be off-color or brittle. Or a solution may show excellent throwing power one time, and only fair or even poor throwing power the next time. This is the reason for the practice of aging solutions—that is, operating them for a time with dummy cathodes. Aging is often helpful, but not invariably so.

Similar things take place with old solutions too. Sometimes a solution that has been working well starts giving bad deposits for no apparent reason. The trouble may continue for a while and then disappear as mysteriously as it started; or it may go on until some way of correcting it is found—or the solution thrown out. It often happens that electrolysing the solution with dummy cathodes is the best way of curing the condition.

Impurities Injure Solutions

Most cases of this kind can be traced to the effect of impurities that have gotten into the solution. These may come from many sources, such as plating salts, anodes, anode bags, filters, filter cloths, tank linings, and so on. Impurities can enter low pH solutions more readily than high pH solutions. Once impurities get in, they are less likely to be plated out, as will be shown below, because of the higher prevailing current densities. Accordingly, with the present trend in plating towards low pH and high current densities, it is more necessary to be careful to avoid impurities than it used to be with high pH, low current density solutions. The need for care also applies to bright nickel solutions, because the effects produced by impurities are generally more readily seen in bright nickel than in dull nickel. Moreover, imperfections which can be glossed over by buffing may be enough to spoil the usefulness of a bright deposit.

Impurities have been suspected as the cause of certain nickel plating troubles for a long time, but suspicion has at last given way to established fact. The effects produced by various impurities are now fairly well understood, and this knowledge is being applied in practice. A number of plants, especially some of the larger ones, now purify nickel solutions at regular intervals. For the most part, the methods used involve treating the solution with chemicals and filtering.

The effects produced by impurities have been described only in a scattered and incomplete way. In view of the general lack of information on the subject, a systematic study of it has been carried on in my laboratory for several years. In connection with this, a study has also been made of methods for removing impurities from nickel solutions. This paper deals with only one phase of the subject, that is to say, with one of the methods of purification that was studied in the course of this investigation. The fact that this method requires no special equipment and can be carried out in any plating shop makes it of special interest.

The most common impurities that have to be dealt with are copper, lead, iron, zinc and organic matter. Identification of the metals is easy. Chemical tests for this purpose need not be described here, since they are readily available in textbooks on chemistry and in the well known book of Blum and Hogaboom. Organic matter is more difficult to deal with, because it can seldom be identified directly. It is most often recognized after eliminating one by one all impurities that can be definitely identified. Various types of organic matter produce quite different effects and require different treatment.

Evidence of Impurities

The presence of impurities usually shows itself through darkening or discoloration of the deposit, reduction in throwing power, or embrittlement. These effects can be seen clearly if a series of bent cathodes are plated in a solution which has first been carefully purified and to which definite increasing amounts of impurity are then added. The first thing that can be seen is a dark colored ellipse at the inside of the bend, which is the area that receives the lowest current density. There is usually also a dark colored contact mark where the cathode is held. As the amount of impurity is increased, the ellipse grows in size and finally spreads until the entire surface becomes dark.

Removal of Impurities

These bent cathode experiments show that there is a relationship between the current density and the ease with which the impurity plates out. The impurity shows itself first in the low current density region; the less the amount of impurity, the lower the range of current density in which its effect can be seen. This suggests that the most effective way to remove impurities by electrolysis is to use low current density. The usual practice, it

will be recalled, is just the opposite. Dummies are put in the tank and as much current as possible is passed through the solution. Electrolysing in this manner is sometimes effective in removing the impurity, but is generally inefficient and expensive, because a large quantity of nickel has to be plated out in order to remove a comparatively small amount of impurity. Accordingly, chemical methods of purification have so far proved less costly in time and material.

The idea of removing impurities from nickel solutions by electrolysing at regulated current densities is a logical extension of the principles underlying the quantitative separation of various metals in electro-analysis. Some of these separations can be carried out so accurately and conveniently that electrolysis has become the preferred method of analysis. For example, one of the most accurate and widely used methods for the determination of copper in ores, alloys and other copper-containing materials is the electrolytic method.

Not every combination of metals can be separated in this way. However, the theory of these separations is well understood, and it is possible to predict reasonably well not only what separations can be made, but also the conditions required. It may be worth mentioning that the method of purification here described was first worked out from theoretical considerations and then confirmed by experiment.

In separating metals by electrolysis, two main factors are involved: first the specific nature of the metals to be separated, and second the effect of the relative amounts of the metals in the solution from which they are to be deposited.

Specific Instances

To make the case as simple as possible at the beginning, let us suppose that we are trying to separate nickel and copper from a solution in which each is present in exactly the same concentration. Under these conditions, the potential difference required at the cathode to deposit copper is less than that required to deposit nickel. This may be seen from the following table, which shows the arrangement of a few of the common metals in the electromotive force series.

Metal	*Volts*
Zinc	—0.76
Iron	—0.43
Nickel	—0.23
Lead	—0.12
Hydrogen	0.00
Copper	+0.34

The higher a metal stands in this series, the greater the potential that must be applied to make it deposit. The metal concentration is assumed to be the same for all the metals in this table. Accordingly if the potential drop across the solution is regulated so that the potential at the cathode is above that for copper but below that for nickel, copper only will be deposited. If the cathode potential is equal to or greater than that of nickel, both metals will deposit together.

The same thing holds true for the separation of nickel and lead. When we come to separate zinc or iron from nickel, the situation is reversed. It is easier to plate out nickel than either zinc or iron; so in order to deposit any zinc or iron at all, the cathode potential must be high enough to plate out nickel at the same time. Theoretically then, it should be possible to get a clean separation of copper or lead from nickel, but not of iron or zinc.

From a practical standpoint we are not concerned with perfect separation. All we are interested in is to get the impurity out without sacrificing too much nickel.

Factors to Be Considered

In actual practice the relative values of the cathode potentials required to plate out the different metals varies with the concentrations in which they are present in the solution. The lower the concentration of a given metal, the greater the potential required to make it deposit. In a nickel plating solution the amount of nickel is usually at least several hundred or even several thousand times as great as the amount of impurity. Consequently, the values in the table must be corrected for the effect of concentration in order to determine the relative order in which the metals will deposit. Furthermore, even if it is possible to plate out the impurities successfully at the beginning, the ratio of nickel to impurity must increase as electrolysis takes place and must eventually reach a point where the conditions become less and less favorable for removal of the impurity.

Polarization is another factor which has to be taken into account. With so little impurity and so much nickel in the solution, electrolysis can not go on long before the greater part of the impurity in the layer of solution nearest to the cathode is plated out, while comparatively little change takes place in the nickel concentration. Unless more impurity is brought up by vigorous agitation or by raising the temperature so as to favor diffusion, it becomes increasingly difficult to plate out the impurity. Efficiency can be maintained only by using a current density low enough to afford opportunity for impurity to move up to the cathode at a reasonable rate. Regulation of the current density is the most convenient means we have for controlling the cathode potential; so by proper choice of current density, favorable conditions for removal of any of the common metallic impurities are obtainable. Increasing the temperature and agitating the solution are helpful in creating favorable conditions for purification.

Practical Considerations

This method of purifying nickel solutions is about as simple as any that can be devised. It avoids the necessity of filtration and requires no equipment except that which is available in every plating plant. The amount of nickel taken out is usually not more than ½ pound to 1 pound for every 100 gallons of solution purified. The loss of nickel can be reduced to some extent by adding enough sulphuric acid to the solution so that a considerable part of the current goes to evolve hydrogen instead of to deposit nickel. The time required depends on how much cathode surface is used, and whether or not good agitation can be obtained. The time may vary from a few hours to a whole day, but at any rate it is often less than would be required for chemical treatment and filtration.

This method has been tried out in the laboratory by making up solutions to which definite amounts of various impurities were added, and also on contaminated solutions which were obtained from various commercial plating plants. By electrolysing these

solutions with a suitable current density, the impurity can be taken out so that its effect can no longer be seen on plating a bent cathode, and even to the point where the ordinary chemical tests no longer give a positive result. The laboratory experiments have shown that copper and lead are easiest to remove, as would be expected. A solution badly contaminated with copper or lead can be purified by electrolysing with a current density of 2 amperes per sq. ft. until the total current passed through the solution amounts to 2 ampere hours for each gallon treated. In removing zinc and iron, somewhat higher current densities are required. At 5 amperes per sq. ft., these impurities may generally be taken out completely by the time the total current passed reaches 5 ampere hours per gallon. These figures apply only when the solutions are warm and well agitated. If the solution is electrolysed cold or without agitation, lower current densities should be used. Time can be saved by warming the solution and using the best agitation possible.

The deposits obtained in electrolysing the solution at these low current densities are generally dark in color, especially at the beginning of the electrolysis. When the solution contains zinc, the deposits are also very brittle.

The results obtained in the laboratory experiments have been confirmed on a commercial scale.

Organic Impurities

So far this discussion has been devotedly chiefly to metallic impurities. We come now to organic impurities, which often give more trouble than the metals. Tests have shown that some types of organic impurities can be removed by electrolysis, while others can not. The best current density to use seems to depend on the particular impurity that is being dealt with. More study is required before any attempt can be made to classify various types of organic matter so as to say which ones can be removed by this method and which ones can not, and what current density to use.

It is well known that nickel deposits sometimes contain carbon which comes from organic matter in the solution. When that is the case, electrolysis as a method of purification would seem to be worth trying. We have been successful so far in eliminating brittle deposits and poor throwing power due to organic matter in a number of cases where other methods fail to produce an appreciable improvement. The current density used in some cases has been from 2 to 5 amperes per sq. ft., and the total current required from 2 to 5 ampere hours per gallon of solution treated. On the other hand, in some other cases the best results were obtained with current densities of 100 to 150 amperes per sq. ft. It is obvious that a good deal of nickel must be wasted at high current densities, unless the purification can be completed in a very short time.

The method of purifying nickel solutions by electrolysis at low current densities has proved useful with some types of bright nickel solutions, particularly with the cobalt-nickel solution developed in the writer's laboratory*. It is not advisable to use it with all bright nickel solutions, because in some cases electrolysis at low current densities is a very effective way of removing the brightener from the solution, which makes purification by this method rather costly. The method is sometimes convenient where it is desired to remove the brightener, so that the solution can be operated as a dull nickel, or converted to the cobalt type of bright nickel.

In conclusion, I wish to make acknowledgment to *William B. Stoddard, Jr.* and *Lawrence Greenspan*, who carried out the experimental work referred to in this paper.

*United States Patent No. 2,026,718.

Plating Casket Hardware

Will you please furnish us with the formula for a brass plating solution for casket hardware made of antimonial lead, 87% lead, 13% antimony. We are contemplating using a lined steel tank for this solution. Also, will you kindly give us a formula for oxidizing the above brass plated hardware. We desire a soft black that will be easily relieved, without cutting through the plate.

The final effect we are aiming at is a dull brass finish, with black shadings in the crevices of the article.

A.—A brass solution of the following composition can be used:

Copper cyanide	3.6 ozs.
Zinc cyanide	1.2 ozs.
Sodium cyanide	7.5 ozs.
Sodium carbonate	4.0 ozs.
Water	1 gal.

Temperature, 100 deg. F.
Current density, 3 to 5 amps./sq. ft.
Voltage, 2 to 3 volts.
Anodes, 80-20 brass.

Add 1 pint of ammonia to the solution after making it up.

This solution can be held in a steel tank. We do not understand what is meant by using a lined steel tank. Kindly advise on this point.

The shade of black desired for the oxidize is not known as no sample is on hand for examination. A good black can be had from the following solution:

Caustic soda	10 ozs.
Arsenic trioxide	10 ozs.
Sodium cyanide	6 ozs.
Water	1 gal.

140 deg. F. Six volts.

—G. B. Hogaboom, Jr.

Strip for Nickel

Q.—I am writing to inquire if you have a formula for stripping nickel which will not pit the metal.

I have tried several formulas, but have not yet found one which will not pit the metal.

A.—Several stripping formulas are given in the Platers' Guidebook 1936 edition, which can be obtained from the *Metal Industry*.

For stripping nickel from steel, the most widely used strip is composed of sulphuric acid plus a small amount of water. The work is made anode at 6 volts.

Excessive water must not be used, as this will result in pitting of the work. Insufficient water, on the other hand, will not allow enough current to flow so that the stripping action is too slow. A good proportion is:

Sulphuric acid	1 gal.
Water	½ to 1 qt.

Use lead cathodes.

Some platers also add glycerine, in the amount of 1 oz. to each gallon of strip figuring that this reduces the amount of pitting on the steel.

—G. B. Hogaboom, Jr.

Synthetic and Semi-Synthetic Enamels

The value and use of this group of finishes, of ever-increasing importance to the metal industries.

By GUSTAVE KLINKENSTEIN
Vice-President and Technical Director, Maas & Waldstein Company, Newark, New Jersey.

ABOUT six years ago, a new group of finishes, called "synthetic enamels" because they contained certain synthetic resins, began to come into use for finishing metal products.

As is the case with most new developments, the synthetics were somewhat slow in gaining acceptance. In time, however, finishers discovered that these new finishes were in many respects far superior to anything of the kind that had so far been produced, and then their use spread rapidly. Today, they are regarded as the best of all finishes for many purposes; and, as the tendency in modern product design is always in the direction of finer and more durable finishes, the synthetics are constantly finding new applications.

The Synthetic Resins Vary in Properties

The synthetics owe their special properties to the bases from which they are made. These bases are allied to certain types of plastics, and, like the plastics, they change their characteristics profoundly under heat, many becoming infusible, insoluble, resistant to heat, very tough and durable, and strongly adherent to the metal base.

Several different types of synthetic resins are commonly employed in the manufacture of synthetic finishes. Some of these are especially resistant to acids, akalies, alcohol, and other chemicals: some stand up exceedingly well under exposure to the weather and the ultra-violet rays in sunlight; and others have other desirable properties.

From these raw materials, the finish manufacturer can make up finishes of remarkable durability under various service conditions. He must, however, vary his formula to secure the best results in specific cases. Hence, as with all other kinds of finishes, when synthetic enamel is used in quantity it should be specially prepared for the given product and service requirements.

Synthetic Finishes are Usually Baked

Depending upon their composition, synthetic enamels air-dry out of dust in from 10 minutes to 4 hours, and become hard in from 2 to 12 hours. They are, however, usually baked since the change in their composition that is responsible for their great durability ("polymerization") takes place only at high temperatures. Ordinary baking schedules vary from 1 to 3 hours at from 150° to 350° F., but in some cases temperatures as high as 500° F. are employed. In general, the longer the baking and the higher the temperature, the harder and more resistant the finish becomes.

Sometimes, when a product is to be subjected to heat but not to rough handling when in service, as with certain electric light fixtures, the finish need only be air-dried by the manufacturer as it will gradually bake in use.

Effective Protection Against Corrosion

As the film of a synthetic finish adheres strongly to metal and is virtually impervious to air and moisture, it provides an effective protection against corrosion. It can not stop the progressive corrosion that is characteristic of steel; but if this is prevented by treating the steel before finishing, the finished product will be proof against rusting for a long period of time.

Hence, synthetics need no primer. On the contrary, they are being more and more widely used as primers themselves, especially on steel products.

Attractive Appearance

In appearance, the synthetics compare well with other types of finish. They cover well in one coat; pigments can be used in them to any desired amount without decreasing their durability; and, as compared with lacquer of the same viscosity, they dry to a thicker film and, therefore, build up well.

They are supplied in a wide variety of color and in several degrees of natural gloss, and they retain their gloss in service much longer than either varnish enamel or lacquer. Some trouble is still encountered in trying to secure depth of gloss and freedom from "orange peel" by rubbing.

Method of Application

The synthetics can be applied in any way used for other finishes—by brushing, dipping, spraying, tumbling, roller coating, and flow coating. They are not as easy to spray as lacquer, and more care has to be taken to avoid orange peel.

As with the lacquers, it is important to use the right kind of thinner with the synthetic enamels, since the synthetic resins are incompatible with certain commonly used solvents, and the use of the wrong combination of solvents will cause trouble. Only the manufacturer of the specific synthetic finish knows exactly what is in it, and his recommendations should be

scrupulously followed in regard to the thinner employed.

Uses

In general, the synthetics are used for finishing products that are to be subjected to severe service, especially those which are relatively high in price and, therefore, should give service a long time without serious depreciation.

The products now being finished in synthetics include: railroad cars, automobiles, trucks, refrigerators, automatic heaters, air-conditioning units, washing machines, vacuum cleaners, type-writers and other office machines, scales, meat grinders, and other store equipment, toys, and sheets from which various products are stamped out.

The finishing schedule will depend upon the base metal employed and the conditions to which the product will be subjected. This is well illustrated by the following examples.

Refrigerators—Few products have to withstand more different kinds of abuse then refrigerators. They ordinarily stand in kitchens where they are constantly subjected to scuffing and marring. Dishes are piled on them. Milk, fruit juices, vinegar, alcoholic drinks, butter fat, perspiration and oil may contact the finish. During humid weather, parts of them may be covered for days with condensed moisture. When they are cleaned, ammonia water or abrasive cleaners may be used.

A fine refrigerator finish, that resembles porcelain enamel and will withstand rough usage for years can be obtained by the following schedule:

Thoroughly clean and rust proof the steel.

Synthetic primer, baked for one hour at 350° F.

Synthetic intermediate coat, baked for one and one half hours at 325° F.

Synthetic finishing coat, baked for two and a half hours at 250° F.

Air-Conditioning Units—Air-conditioning units have to contend with different conditions. They may be exposed to humidity, the weather, wide variations in temperature, and the wear and tear of family life. A schedule that has proved eminently satisfactory for a well-known line of air-conditioning units consists of the following:

Thoroughy clean and rust-proof the steel.

Synthetic primer, baked for 1 hour at 350° F.

Synthetic finishing coat, baked for 1 hour at 300° F.

Automatic Domestic Heater — Domestic heaters are not likely to have liquids spilled on them, or be marred by people constantly passing them. They must, however, be capable of withstanding heat in winter and dampness in summer. A successful finish for the cabinet enclosing the heater or for an automatic stoker, consists of:

Thoroughly clean and rust-proof the steel.

Synthetic primer coat, baked for 1 hour at 300° F.

Finishing coat of any kind of lacquer enamel.

Semi-Synthetic Enamels

Synthetic enamels dry at a comparatively slow rate and for a short schedule, each coat has to be baked after it is applied. Both processes require time, and in some cases, production can be speeded up by using a recently developed modified type of synthetic enamel, called "semi-synthetic enamels".

Semi-synthetic enamels are combinations of a synthetic enamel and lacquer. They combine the toughness and building up properties of the synthetics with the quick-drying qualities of the lacquers. They become hard enough to handle in a few minutes, and can then pass through succeeding manufacturing processes or can be coated with other finishes. For some products, air-drying is sufficient, but the finish is more durable if baked. However, it does not have to be baked as soon as applied; this can be done later after other coats, that also need baking, have been applied. In this way, one or more baking operations may be omitted.

The following is a schedule of a typical application of a semi-synthetic, in grained work on a product where a primer having the properties of a synthetic is desired:

Thoroughly clean and rust-proof the steel.

Semi-synthetic primer, air-dry.

Apply grain, bake 1 hour at 200° F.

Apply coat of flat top coat varnish, bake one hour at 275° F.

If a straight synthetic primer has been used, three bakes, instead of two, would have been required.

Synthetic Enamel and Lacquer Enamel Finishes Compared

The chief differences between synthetic enamel and lacquer enamel finishes can be summarized as follows:

1. *Drying time*—Synthetics dry more slowly than lacquers and consequently pick up more dust than lacquers before they reach the "dust-free" stage. The more durable types of synthetics have to be baked.
2. *Adherence*—The synthetics, particularly the baked synthetics, have better adhesion than lacquer.
3. *Film building characteristics*—Synthetics usually deposit a film of greater thickness than lacquers of the same viscosity. This greater film thickness may reach the proportion of one coat of synthetic equalling two coats of lacquer.
4. *Flexibility*—Synthetics usually have greater flexibility than lacquers.
5. *Durability*—The outdoor durability of the synthetics is usually greater than that of lacquer.
6. *Abrasion Resistance* — Synthetics, particularly baked synthetics, have better abrasion resistance than lacquers.
7. *Gloss retention* — Synthetics generally have better gloss retention on outdoor exposure than lacquers.
8. *Touch-up and repair*—Lacquers can be touched-up and repaired with much less trouble than the synthetics.
9. *Rubbing and polishing*—Lacquers can be rubbed and polished to a deeper and smoother gloss than the synthetics.

Electro-Platers' Exhibit

Our attention has been drawn to errors which appeared in our August issue, on page 396, in the description of the Exhibits of the A. E. S. members' work. *H. J. Harter* of the Springfield Metallic Casket Company, *Patrick J. Kelly* of the Robbins & Meyers Company and *G. W. Speakman* of the Springfield Casket Company were listed as members of the Springfield Branch. They are members of the Dayton Branch, A. E. S. Springfield, Ohio, has no branch of the Society.

Shop Problems CASTING • METALLURGICAL FABRICATION • ASSEMBLING • • PLATING • FINISHING

Questions from readers relating to shop practice and answers by our associate editors

Babbit for Manganese Bronze Bearings

Q.—As a subscriber to *Metal Industry* I have a shop problem that I would like to present in the hope you may be of assistance.

What special precautions are necessary, what type flux should be used and what temperatures are required in the melting and pouring of babbit into manganese bronze bearings, in order to get perfect union between the babbit and the manganese bronze surface?

No difficulty has been encountered when iron bearings are used but with the manganese bronze (2%Mn) the union is not complete although scratch brushing is resorted to and a flux of zinc chloride and ammonium chloride is used.

A.—We suggest the shell be tinned. The usual practice is to tin the surface in order to allow the lining metal to solder fast. We recommend tinning all shells as the lining will then cling uniformly over the entire surface of the shell.

To tin, heat the shell until a bar of solder will melt when held in contact with the shell. Do not overheat. Swab over the surface with a piece of clean woolen waste dipped in a solution of muriatic acid cut with zinc. This solution is made from zinc 1 lb., muriatic acid 3 lb. Rub over the surface of the shell with a stick of half-and-half solder of the best quality and it should melt and flow freely on contact with the heated surface. Sometimes it is necessary to follow with a hot soldering to secure a good coating of solder.

Brush over lightly with a clean piece of waste to rub the solder smooth. After a few trials you will be able to tin any shell whether brass or manganese bronze or iron, satisfactorily. The tinning makes a nice job and will pay on important bearings.

—W. J. R. Problem 5,605.

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Hard Silver Deposit

Q.—We are sending you under separate cover two bottles of silver solution. One is the strike and the other the plating solution. The trouble is that it is plating too tough; does not buff well. We would like to know the silver content; also free cyanide and sodium carbonate content.

A.—The analysis of the silver solution submitted is:

	Plating solution	Strike
Silver	1.41	61 ozs./gal.
Free cyanide	3.43	1.4 ozs./gal.

The free cyanide in the strike solution is too low. Add 6½ ozs./gal. of cyanide. For the strike, you can use sodium cyanide.

In the regular plating solution, you wil get softer deposits if potassium cyanide is used. See formulas as given in the 1937 edition of the Platers' Guidebook, obtainable from the *Metal Industry*. If the solution is already

Use this Blank for Solution Analysis Information

Fill in all items if possible.

Date .....

Name ..... Class of work being plated: .....
Address ..... Volume used: .....
Employed by: ..... Solution depth: .....
Kind of solution: ..... Cathode surface, sq. ft.: .....
Tank length: ..... width: ..... Kind of anodes: .....
Anode surface, sq. ft.: ..... Distance from cathode ..... Original formula of solution: .....
REMARKS: Describe trouble completely. Give cleaning methods employed. Send small sample of work showing defect if possible. Use separate sheet if necessary.

NOTE: Before taking sample of solution, bring it to proper operating level with water; stir thoroughly; take sample in 2 or 3 oz. clean bottle; label bottle with name of solution and name of sender. PACK IT PROPERLY and mail to METAL INDUSTRY, 116 John Street, New York City.

made with sodium cyanide the use of potassium cyanide in addition will not be of any advantage.

The carbonate content of the solution should be checked up and if it is over about 12 ozs./gal. they should be removed.

No recommendation is being made on the silver or cyanide content of the plating solution as it is assumed any additions will be made as required. You can figure that a good solution will have about 3.5 ozs./gal. of silver cyanide (which is 80.5% metal) and also about 3 ozs./gal. of free cyanide.

—G. B. H., Jr., Problem 5,606.

Nickel on Die Castings

Q.—We would appreciate it very much if your Shop Problem Department could furnish us with a formula for the most efficient and effective solution for nickel plating zinc die castings, samples of which are being forwarded to you under separate cover. The finish desired is a highly polished nickel finish.

A.—The formula that appears on page 22 of the 1937 edition of the Platers' Guidebook is suitable for plating die castings.

Single nickel salts	10 ozs.
Sodium sulphate crystals	9 to 16 ozs.
Ammonium chloride	2 ozs.
Boric acid	2 ozs.
Water	1 gal.

Current density 10 to 20 amps./sq. ft. Voltage 2½ to 3.

The Platers' Guidebook can be obtained from METAL INDUSTRY on request.

There are also special proprietary nickel solutions on the market for plating die castings which are advertised in METAL INDUSTRY. These have proven very successful for certain classes of work and suggest you look into them.

—G. B. H., Jr., Problem 5,607.

Nickel on Die Castings

Q.—Under separate cover, we are sending two samples of die cast work together with a sample of a new nickel solution.

We are having trouble plating these zinc castings and cannot account for it. Our procedure is as recommended by a supplier; an electro-cleaner; then a 1% hydrofluoric acid dip; rinse and into the nickel.

Will you analyze the nickel as it seems the fault lies there. Does this particular solution have to be broken in?

We are enclosing the report of our silver solutions received from you last week. Can the fault be there?

A.—The analysis on the nickel solution submitted is as follows:

Nickel	2.1 ozs./gal.
Chloride	1.7 ozs./gal.
pH	5.4 ozs./gal.

If this solution is being used for plating die castings direct the nickel and chloride are all right but the pH is too low.

The pH should be from 6.0 to 6.2 and in order to correct this add 1½ ozs. of ammonia to each 100 gallons of nickel solution. Submit another sample for check on the pH.

The correction of the pH will assist in preventing the blistering. The cleaning procedure may also be at fault, however. If the above suggestion does not eliminate the trouble kindly give more information on your cleaning procedure, i.e. temp. of cleaner, time in cleaner, voltage, time direct, time reverse current, rinses used (whether same rinse for cleaner as after acid) etc.

The fault does not lie with the silver solutions as the nickel is peeling from the die casting.

—G. B. H., Jr., Problem 5,608.

Silver Plating Troubles

Q.—We are sending under separate cover a sample of our silver solution. Would appreciate very much an analysis. This solution is about seven years old, was made up by standard formulae, has been worked by several platers; hard to determine what all is in it now.

We have for several years been using Sterling for anodes. At this time the deposit is very hard and is mottled to such an extent that it is most impossible to polish. It plates very rapidly at low voltage. It has been suggested that there is too high a silver content, I do not have the necessary equipment to make an analysis, and our chemical supply is very limited.

We would appreciate information in regard the use of potassium cyanide and potassium carbonate in silver solution, as to general results in the quality of the plate. Our work is strictly job work; all metals included. I have been polishing and plating for forty years and this is the first time that I have had to ask for help from any source. I think that the trouble has been caused by the use Sterling for anodes.

A.—The analysis of the solution is as follows:

Silver	.87 oz./gal.
Free cyanide	5.18 ozs./gal.

The silver is low. A good formula to obtain a plain white deposit is as follows:

Silver cyanide	3.5 ozs.
Potassium cyanide	4.5 ozs.
Potassium carbonate	5.0 ozs.
Water	1 gal.

The potassium salts are recommended, although the cost is higher, as this type of solution produces a smoother and easier to color deposit. Sodium salts can be used if desired, of course. The above formula will produce a good deposit and can be controlled and maintained in this condition. The free cyanide is slightly less than 3 ozs./gal.

The use of Sterling for anodes has resulted in the solution building up in copper and this contamination was shown by analysis. Pure silver anodes can be readily obtained today and are the only thing to use if the solution is to be constantly maintained in good condition.

It is suggested that consideration be given to the recovery of the silver from your present solution and the preparation of a new solution. The silver can be recovered by plating out, or the solution can be allowed to evaporate to a small volume and the resulting mass taken up with sawdust the whole of which is sent to a refiner.

The hardness of the deposit is also attributable to the carbonate content of the solution. This can be checked, and if the carbonates exceed 12 ozs./gal. they should be removed, which in your case will be difficult as freezing out cannot be resorted to unless by mechanical refrigeration.

—G. B. H., Jr., Problem 5,609.

Metal Casting Digest

Short abstracts of articles of interest to practical non-ferrous foundrymen and metallurgists

By H. M. ST. JOHN
Associate Editor

Metals and Alloys in the Printing Industry. Part III. B. W. Gonser and S. Epstein. Metals & Alloys, March, 1937, page 63.

An illustrated review.

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Mechanical Properties of Tin-Rich White Metals. Toshio Nishihara and Hideo Nishimura. Suiyo Kwai-Shi, Vol. 9, page 99, (1936); Chemical Abstracts, March 10th, 1937, col. 1338.

Two kinds of tin-rich white metals whose compositions are respectively, tin 85, antimony 8, lead 3, copper 5, and tin 78, antimony 13, lead 2, copper 6, were cast in chilled moulds. Their tensile and compressive properties and hardnesses at ordinary and higher temperatures were examined, and the former alloy is found to be superior to the latter on these points.

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The Practicability of Artificial-Plastic Bearings for Rolling Mills. O. Aschilles. Stahl u. Eisen, Vol. 56, p. 1301 (1936); Chemical Abstracts, March 20th, 1937, col. 1739.

Increased output, closer dimensions of the rolled product, lower first cost and lubrication cost are reported for the artificial-plastic bearings.

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Recent Developments in Testing Oil Sands for Cores. N. D. Ridsale. Foundry Trade J., Vol. 56, page 85 (1936); Chemical Abstracts, March 20th, 1937, col. 1739.

A review.

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Bearing Properties of Aluminum-Alloy Bearing Metals (Quarzal). Maxmilian V. Schwarz. Z. Metallkunde, Vol. 28, page 272 (1936); Chemical Abstracts, March 20th, 1937, col. 1745.

Aluminum alloys with 5-15% copper and small amounts of heavy metals and elements which produce a hard constituent on heat treatment have proved satisfactory as bearing metals for heavy duties; at running speeds of 10 meters per sec. they will withstand bearing pressures of not more than 150 kg. per sq. mm. and have a long life at 80 kg. per sq. mm. They are stated to wear better than tin-base alloys, lead bronzes or red brasses and will withstand higher temperatures than the tin- or lead-base alloys, without seizing or melting.

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White Bearing Metals with a Lead-Tin Base. V. Goler and F. Scheur. Z. Metallkunde, Vol. 28, pp. 121, 176 (1936); Chemical Abstracts, March 20th, 1937, col. 1747.

The mechanical properties of lead-tin bearing metals with antimony 13-15 and copper 0-3% are shown graphically. The strength and the resistance to deformation by compression increase as the tin is increased to 10%, but little further change occurs in strength up to 42% tin although the deformability, endurance strength and hot-hardness all decrease. Small additions of copper have little effect on the tensile properties, but tend to restrain segregation during casting. There appears to be no advantage in using alloys with an intermediate tin content instead of lead-rich or tin-rich alloys.

• • •

Magnesium in Ultralight Alloys. P. Bastien. Usine, Vol. 44, page 31 (1936); Chemical Abstracts, March 20th, 1937, col. 1747.

Properties of pure magnesium and development of magnesium alloys are reviewed; of the latter the most important are at present magnesium-aluminum with 4-6% aluminum (ultimate strength 16 kg. per sq. mm. in the cast state and 27-29 kg. per sq. mm. drawn), magnesium-zinc and magnesium-aluminum-zinc with similar characteristics and the magnesium-copper and magnesium-aluminum-copper alloys where those of less than 7% copper have similar characteristics to the preceding and those with 8-12% copper have a high thermal conductivity, used preferably in pistons of internal combustion engines. Precautions to be observed in melting are described.

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The Influence of Foreign Elements on Magnesium Alloys. N. V. Ageev, M. I. Zamotorin and D. N. Shoikhet. Metallurg, Vol. 11, pp. 27, 48; Chemical Abstracts, March 20th, 1937, col. 1747.

The influence of silicon, iron, sodium, potassium, calcium, magnesium oxide and nitrogen on the physical and mechanical properties of Elektron was investigated.

• • •

The Influence of Beryllium on Magnesium Alloys. K. V. Peredelskii. Legkie Metal., Vol. 5, page 39 (1936); Chemical Abstracts, March 20th, 1937, col. 1747.

The addition of 0.05% Be to alloys containing magnesium 92 and aluminum 8% hinders oxidation while melting and casting and increases its resistance to corrosion by sea water. Mechanical properties are not affected.

• • •

Formation of Protective Films on Magnesium-Aluminum Alloys. Werner Geller. Z. Metallkunde, Vol. 28, page 192; Chemical Abstracts, March 20th, 1937, col. 1747.

Measurements of the rate of solution of aluminum containing 0.05—1.0% magnesium in dilute 3:1 mixtures of nitric acid and hydrochloric acid and in 0.001, 0.01 and 20% aqueous sodium hydroxide show that small quantities of magnesium in aluminum increase the resistance of the metal to corrosion in dilute acids and very dilute alkalies, but, with alkaline solutions above a certain critical concentration and above a critical temperature, cause the protective film to be readily ruptured and prevent its healing, so that the metal is violently attacked.

• • •

The Casting of Nickel Silvers. M. Ballay and R. Chavy. Rev. nickel, Vol. 7, page 2 (1936); Chemical Abstracts, March 20th, 1937, col. 1748.

A review.

Modern Production Equipment

New processes, machinery and supplies for metal products manufacturing and metal finishing

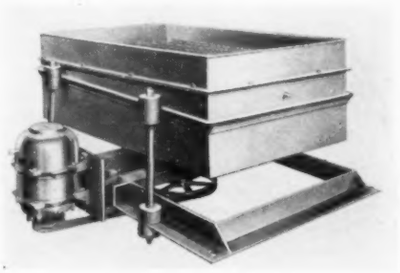
All Rubber Supports On Gyratory Screen

The Beardsley & Piper Company, 2541 N. Keeler Ave., Chicago, are marketing a gyratory screen that features rubber mounting and vibration dampeners on all supports. Two large heavy-duty rubber cushions are used to absorb vibrations at each of four positions on the screen and on the supporting structure to prevent vibration from being imparted to surrounding equipment or superstructure.

Screens operate with a flat slope and are motivated by a revolving throw unit which imparts a constant reciprocating, gyratory motion to the screen that the manufacturer claims cannot be stalled by overloading.

Screens are of stepped design to serve as lump breakers and are of extruded metal, so secured to the frame as to make replacement a simple easy operation.

Drive is through multiple texropes and sheaves, with motor mounted on either of four sides or below the screen frame.



Beardsley & Piper gyratory screen with rubber supports

The maker advises that gyratory screens are made in sizes to suit any capacity or size of operation, in single or multiple deck types as needed. Descriptive Bulletin No. 901 is available.

Measuring Wear Resistance

The Taber Instrument Company, North Tonawanda, N. Y., announces the Taber Abraser, a precision testing machine for measuring the wear resistance, toughness, adhesion and rub-off qualities of surface finishes such as enamels, electroplate, anodizing, etc.

In the research laboratory, the Taber Abraser is said to be indispensable for testing new formulas, control work, checking competitive samples, grading, etc. Its lightness and portability makes it possible for traveling sales technicians to prove their claims and to check competitive materials on location. Concerns manufacturing products that require a tough, wear resisting finish can use the Taber Abraser to determine the type of enamel, number of coats, or thickness of finish necessary to meet use requirements.

Taber Abraser

Lacquer for Oil Burner

The Spencer Heater Company's 1937 model domestic oil heater, which was recently cited as "The Best Design of the Month" by *Electrical Manufacturing*, is an interesting example of certain tendencies in modern product design, according to Maas and Waldstein Company, Newark, N. J., who furnished the finishes used on this heater.

Gilbert Rohde, who designed the Spencer heater, decided that the colors used must be satisfactory under two very different sets of conditions—in the brightly illuminated show room and in the dimly lighted basement. Many colors that are attractive in bright light lose their character in the shadow, and this fact narrowed the range of choice still further. The problem was finally solved by a lustrous lacquer-enamel, Metalustre, in two shades of bluish-grey for the large areas of the heater, with certain details in strong red and in polished aluminum.

The finish used on the Spencer heater also, it is stated, protects the metal from corrosion. This is effected by using a baked synthetic primer under the finishing coat of Metalustre. This type of primer aids in securing a good finish as it dries out of dust in five minutes and adheres strongly to the metal.

Latest Products

Each month the new products or services announced by companies in the metal and finishing equipment, supply and allied lines will be given brief mention here. More extended notices may appear later on any or all of these. In the meantime, complete data can be obtained from the companies mentioned.

Universal Die Making Machine. Does mechanically all the mechanical and most of the hand operations which require the use of separate machines and expert artisans. Frank W. Hack, 440 North Oakley Bldg., Chicago, Ill.

Five-Ton Hoist Combined with Forty-Ton Crane, for all-duty press-room unit. Harnischfeger Corp., 440 W. National Ave., Milwaukee, Wisc.

New Rotary Ventilator, for industrial and commercial building application. For removal of smoke, fumes, excessive heat, moisture, etc. Swartwout Company, 18511 Euclid Avenue, Cleveland, Ohio.

Heavy Duty Torret Lathe. Numbers 3AL, 4L and 5L; for large quantity production or small lot jobbing work. Gisholt Machine Co., Madison, Wis.

Hydraulic Valve; hand lever operated, for 4-way operation (also 2 and 3-way). Uses forged bronze housing, among the largest bronze forgings ever made.

Protective Clothing for Welders; for acetylene and arc work: goggles, sleeves, aprons, leggins, spats, gloves, helmets, hand shields, coats, pants, etc. Davis Emergency Equipment Co., Inc., Graybar Bldg., New York City.

Automatic Wire Straightening and Cutting Machine

A modern, automatic wire straightening and cutting machine, which feeds the wire from the coil, straightens it and cuts it to accurate lengths has been developed by The F. B. Shuster Co., New Haven, Conn. Through the use of two ball bearing, fully enclosed, variable speed units, high speed cut off cam, and quick acting clutch the possibility of marking or swelling the wire is said to be practically eliminated, without the use of intricate mechanism or moving parts. The machine is anti-friction equipped throughout.

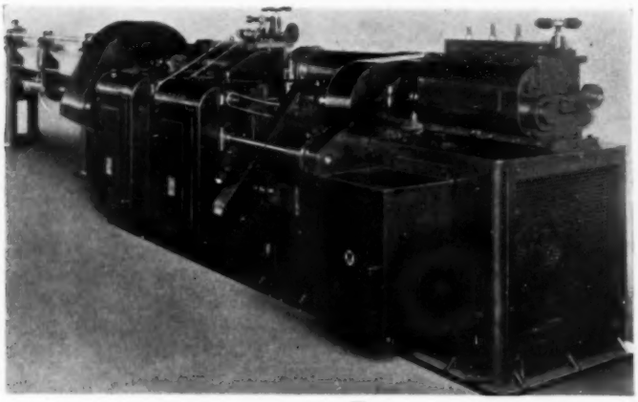
Infinite changes of speed for the feed and cut off are possible through the use of the variable speed units, eliminating the necessity of stopping the machine for changing the speeds. The operating handles are conveniently placed on the front of the machine. One handle operates the feed and rough roll straightening units and the other operates the cut off.

The machine is of unit construction; the preliminary straightening roll housing, the feed roll unit, and the cut off mechanism, as well as the variable speed units are all mounted on a welded steel base.

It is equipped with a preliminary roll straightener to remove the natural curve of the coil and rough straighten the wire before it enters the rotary flier. A standard 5-die steel rotary flier is used for the finishing operation, and the straightening dies may be of hard iron, bronze, babbitt, or any material suitable for the wire being handled. The flier is equipped with square type straightening dies, and patented guides between, which permit feeding the wire through the machine.

The gear drive for the preliminary rough straightener, and the feed roll units are fully enclosed and run in oil.

The straightening flier, feed and straightening shafts are mounted in Timken roller bearings, and the drive shafts are mounted in Norma-Hoffman ball bearings.



Shuster wire straightener and cutter

The new type extension support brackets are mounted on steel pipe. The support brackets are constructed to hold the cut lengths of wire away from the machine, so they can readily be removed with a crane.

The guide bar cover is operated by a separate cam, independent of the cut-off cam, and the guide bar itself is stationary, being fastened to the extension supports.

The machine can be furnished with a front feed roll unit, containing a single pair of feed rolls, or with a double unit.

The variable speed units may be eliminated, making a constant speed machine, if desired, retaining all the anti-friction features and other engineering features throughout the machine. It is made in several sizes.

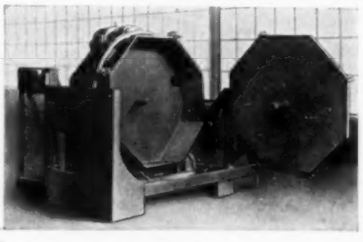
Ball Return Burnishing Barrel

In the plant of a cash register manufacturer, the problem of burnishing the insides of cast aluminum change drawers has always been an annoying one. Various methods have been used, including the operation of a burr on a flexible shaft. Of the operations tried, those that were efficient were too costly and those that were economical failed to produce all the results desired.

Engineers of N. Ransohoff, Inc., Cincinnati, O., adapted one of their standard ball return burnishing barrels to the requirements and the finishing operation is now accomplished by ball burnishing, a method that is feasible only because provision is made for the automatic transfer of the balls, eliminating all manual handling. The barrel is equipped with a 48" drum into which can be fitted a fixture for holding the drawers rigidly in place, spaced at regular intervals around the periphery.

When the barrel is run in burnishing direction, the balls enter the burnishing section from the ball-storage compartment. They work inside the cups in the drawers. After running the proper length of time, the ball-return passage is closed, the drum is reversed and all opposite surfaces of the pockets and drawers are burnished. Upon completion of this operation, the ball-return passage is opened and the balls automatically return to the storage compartment. The balls and work are rinsed by water from lines let into the hollow shaft and swivel joint. Spent soap and water drain out through screened valves in ball compartment. The barrel head is swung open, the fixture is taken out and a new load of work, similarly attached to a fixture, is put in. This completes the cycle.

This system has eliminated all labor of handling burnishing balls, a considerable item, as the barrel handles about a ton of balls.



Ransohoff ball-return burnishing barrel

Traveling Welding Demonstrator

Carrying the latest and most popular types of General Electric Company, Schenectady, N. Y., arc-welding equipment, a demonstration truck has started an itinerary which will eventually take it all over the Atlantic seaboard and as far west as the Rocky Mountains. Thus, welding operators, superintendents, plant managers, and other people interested in fabrication and repair work will have an opportunity to test for themselves the newest types of G-E arc-welding equipment.

Included in the traveling exhibit are the new mutator set for light-gauge arc-welding, a new model d-c single-operator set, three kinds of a-c transformer-type arc welders, and a large variety of new and improved electrodes and accessories. Demonstrations are being conducted by a G-E arc-welding expert in cooperation with local G-E arc-welding distributors and specialists.

G. E. Traveling welder

New Dielectric Enamel

A new black enamel, with special dielectric properties, has been developed by Maas & Waldstein Company, makers of industrial finishes, Newark, New Jersey. This new dielectric enamel is especially recommended for finishing electrical apparatus, such as steel switchboards and instrument panels, coils, and radio bases. It dries to a rubber finish, and is tough, durable, and has high electrical resistance, according to the manufacturer. It is applied by spraying, and a switchboard panel that has been marred or defaced can be easily re-finished without dismantling by spraying on another coat of the enamel.

A surfacer, with similar dielectric properties, is also supplied for preparing the surface to be finished with the enamel.

This finish was used on all the switchboards and buss boards in all the power plants and substations in Los Angeles and in the Owens Valley system that brings the power from Boulder Dam to Los Angeles.

Spring Making Machinery

The Torrington Manufacturing Co., Torrington, Conn., which, since 1885, has specialized in the design and building of special machinery for the manufacture of strip, sheet, tube, rod, wire and cable of ferrous and non-ferrous metals, announces its entry into the field of spring making machinery.

The new machinery developed is said to have the following features:

Simple feed adjustment.
Safety hand wheel.
Fully enclosed, compact, built-in motor.
Ample wire and coil capacities.
Timken roller bearings.
Convenient accessible controls for pitch diameter, cut-off, etc.
Square clean cut ends.
Variable production speed by gear changes or standard variable speed units.
Adjustable wire feed.

The machines are made in four sizes covering a range from 0.006″ to ¼″ diameter wire. The Torrington Company is prepared to supply all necessary tooling for any requirements within the range of these machines and attachments for long coils, square or odd shaped wire coiling rings, etc.

Torrington spring making machine

Portable Electric Sander—Rubber—Polisher

Streamlined in design and having a balanced mechanism to impart a smooth quiet reciprocating motion to the two rapidly moving blocks which simulate a tremendously speeded up hand motion, a new portable electric machine is said to be adaptable to a wide range of work in several different industries. This machine is made by the Finishing Equipment Co., 222 E. Ohio St., Indianapolis, Ind.

Fitted with abrasive paper or cloth drawn tightly over the pads, the machine can be used for smoothing the surfaces of bare metal, for removing old finishing coats or for sanding lightly between coats in the course of the finishing process; adaptable to either dry or wet sanding.

With only the felt pads exposed, or with ordinary burlap covering the pads, machine is said to serve as an excellent portable rubbing machine, working with pumice and oil, pumice and water, or with any other rubbing or polishing compound.

With polishing cloths or sheep's wool drawn over the pads, the machine is recommended as a rapid polisher for any finished or plated surface capable of being polished. It can be used on flat or curved surfaces and against the shoulders of inside corners. A handy extension cord plugs into any electric light socket; for A.C. or D.C. electric service, 110 to 115 volts. Weight approximately ten pounds; size 11″ long, 8″ high, 3½″ wide. Ball-bearing equipped. Patent applied for.

"Dual-Blok" portable sander and polisher

Portable Brush Electro-Plating

Nickel-Chromium Plating Corp., 3429 West 47th St., Chicago, Ill., has placed on the market a portable brush electroplating outfit. It is claimed that this machine, called the Connecticut Brush Electroplater, is capable of depositing dense, adherent coatings at a considerable saving both in time and labor. Numerous machines, it is stated, are in operation among railroads, buildings, steel mills, food manufacturing plants, milk plants, public utilities, and general manufacturing plants. The operation, it is claimed, is simple, and can be learned by the average person in a very short time. Labor is practically 90% of the cost of plating. One quart jar of the special controlled plating solution supplied will cover an area of approximately 40 sq. ft.

New Refinishing Material

A new automotive finish known as Automotive "Pyralux" is announced by the E. I. du Pont de Nemours & Co., Wilmington, Del. Designed chiefly for touching up synthetic resin finishes and for re-coloring used cars, it is said to combine certain desirable qualities of lacquers and synthetic resin enamels.

Automotive "Pyralux" dries with a speed approximating that of "Duco" and has a high initial gloss that requires no rubbing. Its chalking resistance is comparable to that of baking "Dulux", thus making it useful for touching up baked synthetic enamels and for complete repainting of used cars.

The quick-drying features of "Duco" are known. However, it requires rubbing and polishing to bring it up to a high luster and both refinishers and du Pont chemists wondered if it were possible to eliminate this operation.

Then "Dulux", which does away with rubbing and polishing, was developed by du Pont chemists. It has high initial gloss and good build, but it doesn't dry as fast as "Duco", and for touch-up jobs on "Dulux," it is too slow. So the problem of developing a new type of finish was attacked.

Automotive "Pyralux" is a straight nitrocellulose product especially developed to meet a specific need by combining the features of lacquer and synthetic enamels. It is said to possess fairly high initial gloss, with good build and flow out, and to dry with a speed approximating that of "Duco."

The chalk rate is virtually the same as "Dulux," thus making it a finish for touch-up jobs on "Dulux" and baked synthetics because repair spots will not show up badly after exposure. And with "Pyralux" rubbing and polishing are not required.

It is recommended for patching and repairing baked synthetic enamels and as an overall finish on used cars where the higher quality of "Duco" is not needed, and a lower priced finish is desired. It may also be used on all types of general refinishing on metal. This new finish is offered in black and 26 popular shades.

Acid Resisting Buckets

The Haveg Corporation, Newark, Delaware, has recently perfected a new acid resisting bucket. It is made of a molded phenolic resin asbestos composition which, it is stated, is unaffected by acid, and also highly resistant to salts, chlorine, weaker bases, many solvents and other chemicals.

Haveg composition bucket

As it is not simply a lining, its chemical resistance exists throughout its entire mass. It is a strong, tough material, said to be unaffected by rapid temperature changes and can be used up to 265° F.

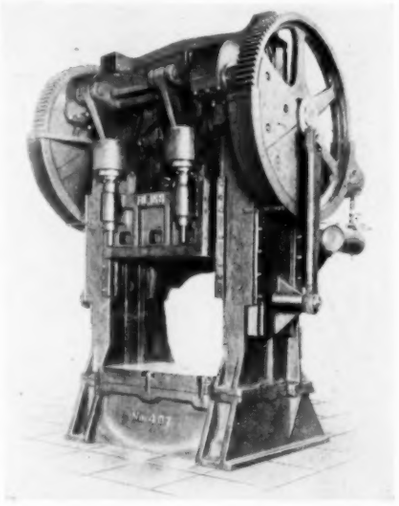
Standard Haveg Buckets are made in six sizes with capacities from 8 to 12 quarts, varying from 8 to 12½ lbs. For full information write to Dept. MIN., Haveg Corporation, Newark, Delaware.

Toggle Drawing Press

While it is true that the single-action press with built-in drawing cushions to do double action work has become increasingly popular, there is a very definite limit to the range of work which can be accomplished with this type equipment. In other words, the use of high blank-holding pressures, particularly with deep draws, involves a decided increase in capacity of the driving train on the press, including motor and flywheel. The toggle double-action press, illustrated below is said to have advantages in positive gripping for stretching jobs with draw beads and in power economy on deep draws. It can draw a shell 10 inches in depth giving maximum efficiency in the process. Then it, also, can be converted from a double-action into a triple-action press by the addition of Marquette drawing cushions in the bed.

E. W. Bliss Co., Toledo, O., manufacture the No. 407 double-crank, double-action, straight-sided, toggle drawing press illustrated below. It is a long stroke model. Its frame is made of four separate castings held together by extra heavy steel tie-rods which are shrunk in. A 35 horepower electric motor drives the flywheel through V belts, which in turn drives the double geared twin drive train of gears.

The control is completely electric, with push buttons to start, stop, or inch the press, (a valuable asset in die setting). The clutch is a new Bliss full automatic, air operated, combined friction clutch and brake with the clutch mounted in the flywheel. The flywheel is mounted on Timken roller bearings.



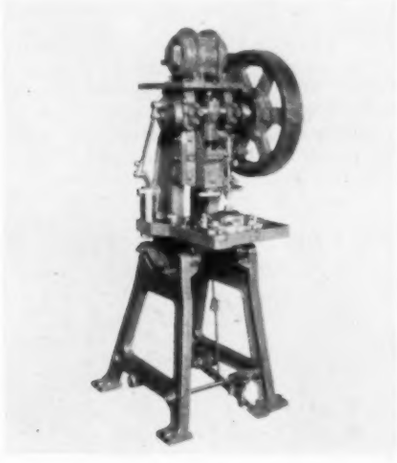
Bliss No. 407 toggle drawing press

The crankshaft and the intermediate shaft have renewable bronze bushings while the driveshaft is mounted on renewable Timken roller bearings.

The bed is completely arranged for the addition of air cushions should it become necessary, to save time and money in installing cushions.

Special Automatic Press

The press illustrated below was recently adapted by the Toledo Machine and Tool Co., 1420 Hastings St., Toledo, Ohio (division of E. W. Bliss Co.) for a special piece of work requiring an eight-station dial feed for etching with acid, the trade-mark and number on hardened steel parts. Attached to the slide is a rubber stamp die which is rotated 180° every stroke of the press. The back stamp die comes down touching a pad of acid, then on the next stroke rotates 180° to the front and applies it to the work which has been placed under the die by the dial feed. At the same time that the die with the acid has rotated to the front, the die that was in front rotates 180° to the rear to pick up more acid for the next impression. Thus, a piece is etched for every stroke of the press and continuing around in the dial, is dropped through a hole in the bolster into a container.



Toledo No. ¾ special automatic press

The press, itself, is a "Toledo" No. ¾ open back inclinable, with a 1½" stroke, 6" shut height on the bed and a 1" bolster. A ½ horsepower 900 R.P.M. motor is geared directly to the flywheel supplying the motive power.

Magnesium Die Castings

The Doehler Die Casting Co., Toledo, Ohio, has just announced the addition of magnesium base alloys to their list of die casting alloys which includes tin, lead, zinc, aluminum and copper base alloys.

Magnesium is the featherweight of the known commercial metals. It is fully one-third lighter than aluminum and on the weight unit basis, is the strongest metal.

The Doehler Company has standardized on three magnesium alloys having a tensile strength of up to 35,000 pounds per square inch and an elongation of up to 10%, although other alloys are also available to meet special service requirements.

The addition of magnesium to the list of available die casting alloys combines the labor saving feature of the die casting process with the weight saving feature of magnesium.

New Protex

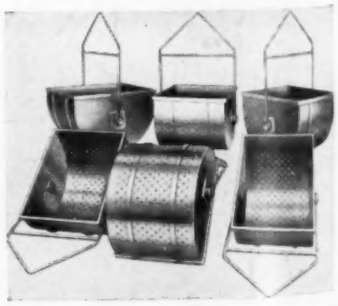
To make it easier to use Apollo Pre-Finished metals, sheets plated with nickel and chromium and polished to high lustre, the Apollo Metal Works of Clearing, Illinois, announces a new Protex, said to be even better than the Protex first brought to market by this company a few years ago. It "sticks" well to highly polished surfaces during forming and bending operations and then may be easily peeled off or removed without leaving trace of the adhesive.

The manufacturers state that Protex speeds production, reduces costs and is much more efficient when used in stamping than the old method of using ordinary paper to prevent die scratching. Samples or additional information on this metal covering can be obtained from the Apollo Metal Works for the asking.

Pickling Baskets and Crates

Pickling baskets and crates made of the metal to suit individual requirements are manufactured by the Kirk & Blum Manufacturing Company, Cincinnati, Ohio. As a result of their research and experience they are prepared to meet promptly the requirements for any type and size of perforated buckets and baskets, crates, tubs, racks, and lead or rubber-lined steel tanks. Modern manufacturing methods and skilled metal craftsmen make possible sturdy and durable products.

In determining the right alloy and the correct design for a particular pickling problem, the Kirk & Blum Engineering Department will lend its assistance.



K & B perforated pickling baskets made of special aluminum bronze alloy; for small stampings, etc.

New Lever Motor

There is a new lever motor on the market which is reported to have been designed and constructed specifically to overcome the traditional shortcomings of this type of device, giving it a much broader field of application.

This new product, manufactured by the Taylor Instrument Companies, Rochester, N. Y., is known as the Motosteel Evenaction Lever Motor. Its outstanding claims include:

All-steel welded construction—same as the recently announced Motosteel diaphragm valve—for maximum strength, lightness of weight, and permanency of alignment.

Precision operation characteristics which insure a uniform relation between the air pressure applied to its diaphragm motor and the resulting lever travel throughout its stroke.

Practically free from hysteresis: A deeper diaphragm with larger area gives greater power and smoothly modulated action. Ball bearing roller bearings guide the full stroke of the push rod. The lever is pivoted in phosphor-bronze bushings which are alignment-reamed in same manner as automobile engine bearings.

A number of take-off holes are provided throughout the length of the lever so that the force or travel of the motor may be adjusted.

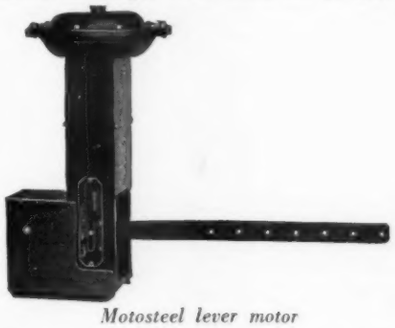
Power of either up-stroke or down-stroke can be increased or decreasd by spring adjusting nut.

The lever action can be reversed by substituting another lever and transposing the fixed and movable pivots.

Limit stops are provided for both up-stroke and down-stroke.

Base is drilled for mounting on floor, wall or ceiling, making possible an infinite number of mounting positions. Works equally well in all positions.

Three sizes of lever motors; in terms of maximum damper areas which can be accurately positioned—25 sq. ft., 50 sq. ft., 120 sq. ft. When the Taylor Valv-Precisor or Dubl-Response Control Unit is operated in conjunction with any of these three motors, these damper areas may be increased appreciably.



Motosteel lever motor

May be operated by remote manual control, by an electro-pneumatic switch, or by a pneumatically operated controller. It also may be operated in parallel with a diaphragm valve or other pneumatic equipment, if desired.

The manufacturers recommend this new lever motor for the operation of dampers, lever operated valves, butterfly valves, electrical rheostat for variable speed motors, for the control of electrical equipment, or for the operation of any device by the conversion of pneumatic energy to linear or angular mechanical motion.

Portable Industrial Cleaner

A portable industrial cleaner of a new design has been placed on the market by the Ideal Commutator Dresser Co. of Sycamore, Ill. This cleaner provides for the direct deposit of all heavy dirt, metal scrap, filings, etc., directly into a steel tank from which they can be easily salvaged. Very fine dust passes into a dust-proof bag. This machine can be used for cleaning floors, walls, overhead pipes, machinery, stock bins, etc. With special attachments it can be used for cleaning boiler tubes by scraping out the soot and scale and sucking it up.

"Ideal" vacuum cleaner or blower

The cleaner is recommended for cleaning open hearth furnaces, and electrical furnaces and industrial ovens without swabbing; also for cleaning hollow castings, removing chips and preventing the dust from filling the air. The manufacturers state that it salvages scrap from benches and floors, such as metal filings, lead dust, etc.

Industrial Finishes

The Everseal Manufacturing Co., Inc., Fisk Building, New York City, has introduced a new line of modern industrial maintenance finishes. These formulations fortified with Bakelite resins, are recommended from the standpoint of durability and resistance to moisture, rust and corrosion, acids and alkalis. The manufacturers state that these finishes set quickly and dry with smooth porcelain like surfaces.

The line of F. W. B. finishes comprises the following: Floor Varnishes; Mill Whites; Dado Enamels; Aluminum Finishes—Exterior and Interior; Heat Resistant Aluminum Finishes; Metal Trim Enamels; Machinery Enamels; Heat Resistant Enamels; Spar Varnishes; Alcohol-Resistant Varnishes.

Wrinkle Finishes

A group of wrinkle finishes called the "5 Hilo Rip-pls" are new products of the Hilo Varnish Corporation, 42-60 Stewart Ave., Brooklyn, N. Y. These finishes comprise the following types:

Fine Gloss (Synthetic)
Fine Dull (Synthetic)
Medium (Oil Type)
No. 150 (Oil Type)
Air Form-Low Bake (Oil Type).

These finishes give wave line effects in one coat when applied to non-porous surfaces. Films are hard and tough, resistant to water, alcohol and grease. One coat hides surface imperfections.

All of the above coats are obtainable in a variety of colors. Practically any two-color combination or shading may be obtained by first applying a coat of Rip-pls of any desired color and over this a thin coat of lacquer enamel or oil enamel of the second color.

Metallic effects may be obtained by mixing the metallic powder with the Rip-pl, or by first obtaining the Rip-pl finish and putting over it a lacquer or enamel containing the metallic powder.

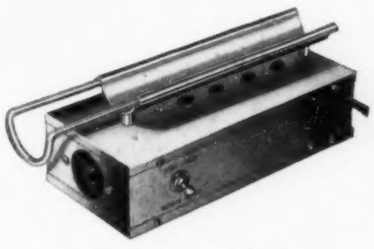
These finishes, it is stated, require no special treatment other than sufficient baking heat, which varies from 1 to 4 hours at temperatures of 120 to 225° F., depending upon the finish desired. The Air Form-Low Bake (Oil Type) Rip-pl can be set by air drying for 48 hours, if desired, instead of baking.

Variable Heat Control

A device for regulating the heat of soldering irons to suit individual requirements is a recent development engineered by the Drake Electric Works, 3656 Lincoln Avenue, Chicago, Illinois. Exclusive representatives are Surpless, Dunn & Co., 34 N. Clinton St., Chicago, Ill. and 74-75 Murray St., New York.

With the use of the Drake Heat Control, the operator, it is stated, can keep the soldering irons warm at low cost. A flip of the switch makes the iron ready for use in a few moments. This mechanism also keeps the tips properly tinned.

Drake Heat Control can be used with any soldering iron not exceeding 150 watts imput; 115 volts AC or DC.



Drake heat regulator

Scrap Truck

A new scrap truck has been designed by the All Steel Welded Truck Corporation, Rockford, Ill. The special features of this truck are:

All electric welded construction.

All steel welded scrap truck

Large wheels with Hyatt type roller bearings.

Available with front legs and locking pin, or with swivel castors, 6" wheel.

Special sizes are available to meet individual requirements.

New Beryllium Alloys

R. H. Harrington of the Research Laboratory, General Electric Company, Schenectady, N. Y., has recently developed two alloys of copper containing beryllium. Both alloys, it is stated, have high thermal and electrical conductivities and other excellent physical properties. The properties are developed by quenching and ageing treatment, or by a modified ageing treatment coupled with cold work.

One alloy (Trodaloy No. 1) contains 97% copper, 2.6% cobalt and 0.4% beryllium. The best physical properties are obtained from this alloy when it is quenched from 1650 deg. F. and reheated at 935 deg. F.

	Cast and Heat Treated	Forged and Heat Treated
Tensile strength, psi.	90,000	100,000
Proportional limit, psi.	45,000	45,000
Elongation, %	10	20
Reduction of Area, %	20	24
Brinell Hardness	220	220

The electrical conductivity in the above condition is 45% that of copper.

Temperature has the following effect on the tensile properties of cast bars, quenched and reheated:

	At 20°C.	At 350°C.	At 475°C.
Tensile strength	90,000	68,000	56,000
Elongation	10%	4%	1%
Reduction of area	20%	4%	2%

The second alloy (Trodaloy No. 7) contains 99.5% copper, 0.4% chromium and 0.1% beryllium. Heat treatment consists of quenching in water at 1700° F. and ageing for one hour at 935° F. The following properties are developed:

Tensile strength	30,000 to 35,000 psi.
Proportional limit	15,000 to 16,000 psi.
Elongation	10 to 15%
Hardness	80 Brinell
Electrical conductivity	72 to 75%

Electrical conductivity in the above condition is 73% that of copper.

By heating one hour at 900° C, then cold working the cast rod from 1¼" diam. to 1" diam. and then heating for one hour at 500° C, the following physical properties are developed:

Tensile strength	46,200 psi.
Proportional limit	27,000 psi.
Elongation in 2 in.	20%
Electrical conductivity	73%
Brinell hardness	— 108.

Trodaloy No. 1, when used for soldering tips at temperature below 500° C, is said to show 3 to 10 times the life of ordinary soldering coppers. It is also recommended for electrodes in the resistance welding of stainless steel, for springs and for current carrying shafts and bushings, and for electrode holders in arc welding. Trodaloy No. 7 is recommended for electrodes for the resistance welding of steel.

Gas Tight Goggles

H. S. Cover, South Bend, Indiana, is the inventor of a recently improved gas-tight goggle, called the Clear Vision "Nod and Shake" Goggle. This goggle, it is claimed, is gas tight and does away with fogging, without removing the goggles from the face. All that is necessary is, it is claimed, to nod and shake the head and the fogging is eliminated.

It is used with self-contained oxygen helmets of the best type. The wearer does not need to remove the goggles to clear them, which adds greatly to the efficiency of the operator.

Cover's gas-tight rubber goggles

Watch for the October Metal Industry!

The October number of **Metal Industry** will be the **Pre-Convention Issue** of the **National Metal Congress.**

The feature article will give all the advance information about the Congress.

1. Complete Technical program related to metal manufacturing and finishing.

2. A list of exhibitors—what they will show—where they will be located.

Other features of this issue will be:

Methods of Joining Copper Alloy Products, by I. T. Hook, (continued).

Specifications for Electroplating Chemicals, by M. W. Schwarz.

Watch for the October Metal Industry!

What the Reader Says

Filtering and Agitating Silver Solution

Editor, Metal Industry:

In your June issue on page 297 under the title, "Filtering and Agitating Silver Solution," your expert made the following statement:

"Continuous filtration would agitate solution well enough but it must be borne in mind that a certain amount of aeration of solution takes place resulting in quicker formation of carbonates. ••••••"

While we do not dispute your expert in this particular instance, the answer nevertheless might mislead a number of those using or intending to use continuous filtration, by giving them the impression that this type of filtration is not good. There are several dozen silver firms who purchased the pneumatic filters and have never noticed any harmful results while they did clean the bath very efficiently.

We also wish to point out that this question has been discussed pro and con for many years but that we ourselves have installed over 15,000 continuous air filters which are operating successfully.

This point alone as well as the fact that plating engineers both in this country and even more so in Europe are adopting continuous air filtration in ever increasing numbers, proves that this method is sound from both an engineering as well as practical standpoint.

In addition to the above we have installed over 1,000 pneumatic filters in electrotype foundries. Electrotypers find these units indispensable in their work. As a matter of fact any one of them will readily state that he cannot possibly get along without our filters.

To sum this matter up in one statement: it is a proven fact that filtration is rapidly becoming indispensable in the plating of nickel and acid copper as well as silver.

Belke Mfg. Co.

Chicago, Ill.

The letter from the Belke Mfg. Company, on the subject of filtration should have been sent to T. H. Chamberlain, as he was the one who answered that question, although my initials are on it. This mix-up is of no importance because I would have answered the question in dispute about the same way as he did.

The original inquiry asked the specific question: "—whether it may be detrimental to have silver plating solution agitated in this manner". There is no question as to the benefit of filtration.

The very first sentence of the answer satisfies the inquiry, namely that although all agitation will increase plating speed, it will result in formation of carbonates. High concentration of carbonates will decrease the solution efficiency.

There is nothing that would give the impression that air agitation is harmful in other types of solutions.

The Belke letter proceeds "To sum this matter up in one statement; it is a proven fact that filtration is rapidly becoming indispensable in the plating of nickel and acid copper as well as silver". This is a perplexing summary of the matter as in the first place it has nothing to do with the matter and in the second place I know of no reason for making this a controversial question as you will find no one, or at least no one that I know of, who will take the opposite stand.

In my mind, the matter can be summed up as follows:

Air agitation is not to be recommended for a silver cyanide plating solution because it will increase the rate of formation of carbonates, which is not desirable, as explained above.

G. B. Hogaboom, Jr.

Newark, N. J.

Editor, Metal Industry:

With reference to your letter of July 6 and Byron Hogaboom's answer to comment made by Belke Mfg. Company concerning an answer by the writer to an inquiry relative to filtering and air agitating of silver solutions, I wish to confirm what has already been written.

It is a well known fact that air agitation of cyanide solutions is extremely detrimental for several reasons, which briefly are as follows: (1) the rapid increase of carbonate concentration resulting in lowered efficiency of the bath; (2) the increase of maintenance cost due to break down of cyanide which means frequent additions; (3) higher concentrations of cyanide are required to obtain proper anode corrosion and to prevent anode polarization.

The writer in no way wishes to leave the impression that air agitation is detrimental to all types of plating solutions. It is quite true that air agitation of acid copper baths is highly beneficial in a great many instances. The question that was answered dealt purely with air agitation of a cyanide silver solution and should not be confused with air agitation of plating solutions in general.

T. H. Chamberlain.

New Haven, Conn.

Technical Publications

The Properties of Lead and Lead Alloys. Summary Report on The Fatigue Resistance of Lead and Lead Alloys, by H. Waterhouse. British Non-Ferrous Metals Research Association, Regnart Bldgs., Euston St., London, N. W. 1. England. Price 2 s.

Creep of Non-Ferrous Metals and Alloys. A review of published information, by W. A. Baker. British Non-Ferrous Metals Research Association, Regnart Bldgs., Euston St., London, N. W. 1. England. Price 2 s.

The Determination of Cadmiun in Tin-Rich Alloys, by Dr. D. Hanson and Dr. W. T. Pell-Walpole. International Tin Research and Development Council, 149 Broadway, New York.

The Electrodeposition of Tin from Acid Sulphate Solutions, by A. W. Hothersall and W. N. Bradshaw. International Tin Research and Development Council, 149 Broadway, New York.

The Decoration of Tinplate by Printing and Varnishing, by W. E. Hoare. International Tin Research and Development Council, 149 Broadway, New York.

Counter Gravity Die Casting of High Melting Point Metals, by Samuel P. Wetherill. Journal of the Franklin Institute, 20th St. and Parkway, Philadelphia, Pa. August, 1937.

Government Publications

Stories of American Industry. Paint, automobiles, building, electrical goods, office appliances, etc., including "Industries of Tomorrow". Superintendent of Documents, Government Printing Office, Washington, D. C. Price 10c.

Report on the Progress of the Works Program (March, 1937) Works Progress Administration, Washington, D. C.

Associations and Societies

Institute of Metals Division

29 W. 39TH ST., NEW YORK

The Fall Meetings of the Metals Divisions will be held at Atlantic City from October 18-21 as a part of the National Metal Congress and in conjunction with the National Metal Exposition. The headquarters of the A.I.M.E. Metals Division will be at the Ritz-Carlton Hotel where registration, technical session, Science Lecture, Metals Divisions Dinner, and all A.I.M.E. committee meetings will be held. The Round Table Discussion on the Physics of Metals, in which the A.I.M.E. is joining with the several other societies as designated in the detailed program, will be held Monday night at the Exposition Auditorium.

The meetings of the early part of the week, namely, the Round Table Discussion on Monday evening, the technical session on Tuesday morning and the Science Lecture on Tuesday afternoon, will comprise a sequence of meetings devoted to the *Physics of Metals.* The Round Table will cover discussions of stress-strain relationships of unilateral, bilateral and three dimensional stresses, true stress strain curves, and the transmission of energy through crystalline media. The technical session on Physics of Metals will have papers on the theory of diffusion, a study of the flow of metals with particular reference to elongation at the yield point, and a paper on the meaning of impact tests. The Science Lecture, concluding this sequence on the Physics of Metals will be by Professor *Arthur F. Benton* of the University of Virginia, speaking on the subject, "*The Behavior of Gases at Metal Surfaces*". Other technical sessions will be devoted to general metallurgy, metallography and open-hearth steel practice.

A luncheon meeting of the Executive

Committee of the Institute of Metals Division will be held on Thursday, October 21.

The Annual Fall Dinner of the Metals Division will be on Wednesday evening.

The National Metal Exposition will open in the Atlantic City Auditorium at noon on Monday, October 18, and will open from noon to 10:00 P. M. on each of the first three days of the week. On Thursday, the Exposition will open from 12:00 noon to 6:00 P. M., and on Friday from 9:00 A. M. to 6:00 P. M.

Members and visitors are cordially invited to come to the A.I.M.E. booth in the Metal Exposition, rest, converse with friends and enjoy moving pictures that will present phases of the mineral industries that are complementary to the daily activities of the metallurgists.

Tentative Program

All sessions will be at the Ritz-Carlton Hotel with the exception of the Round Table Discussion of the Physics of Metals, a joint meeting of the A.I.M.E. Metals Division with the American Society for Metals, the American Society for Testing Materials and the American Institute of Physics. This Round Table session on Monday evening will be held in the Exposition Auditorium.

MONDAY, OCTOBER 18

10:00 A. M. to 5:00 P. M.—Registration.

8:00 P. M.—Physics of Metals—Round Table Discussion. Exposition Auditorium—(Round Table Discussion sponsored jointly by A.M.I.E. Metals Divisions, American Society for Metals, American Society for Testing Materials and the American Institute of Physics.

Stress-strain Relationships for Unilateral, Bilateral and Three-dimensional Stresses. Stress-strain Curves.

Energy Transmission Through Crystalline Media.

TUESDAY, OCTOBER 19

10:00 A. M.—Physics of Metals

A Theory of Diffusion in Solids by John E. Dorn and Oscar E. Harder.

The Flow of Metals. Part I. Homogeneous and Heterogeneous Deformation at the Yield Point Elongation by M. Gensamer.

Meaning of Impact by Prof. Earl Smith.

2:00 P. M.—The Science Lecture of the Metals Divisions.

Behavior of Gases at Metal Surfaces by Prof. Arthur F. Benton, School of Chemistry, University of Virginia.

WEDNESDAY, OCTOBER 20

2:00 P. M.—Metallography.

The Effect of Chromium on the Grain Growth of Brass by Bruce W. Gonser.

7:00 P. M.—Dinner, Institute of Metals and Iron and Steel Divisions, Ritz-Carlton Hotel.

THURSDAY, OCTOBER 21

10:00 A. M.—General Metallurgy

Investigations on Lead-Magnesium Alloys for the Prevention of Lead Poisoning in Waterfowl by R. L. Dowdell and R. G. Green.

Use of Tellurium in Copper-base Alloys by H. L. Burghoff and D. E. Lawson.

12:15 P. M.—Luncheon meeting, Institute of Metals Division Executive Committee.

American Foundrymen's Association

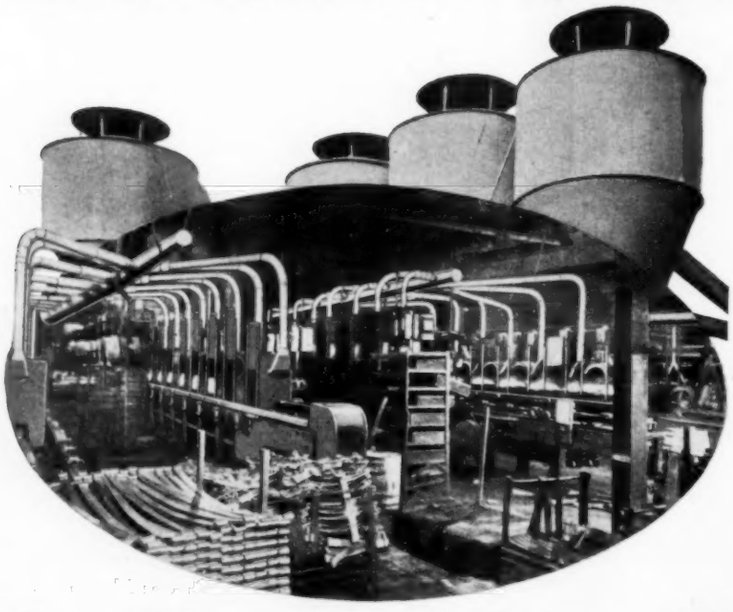
222 W. ADAMS ST., CHICAGO, ILL.

The Board of Directors of the American Foundrymen's Association, meeting in Chicago, July 20, accepted the invitation of the Northeastern Ohio Chapter and the city of Cleveland to hold its next convention and exhibition in Cleveland, May 14, 16, 17, 18 and 19, 1938. The last previous convention and exhibition of the American Foundrymen's Association held in Cleveland was in 1930.

The exhibition which will occupy the splendid facilities of the public auditorium and Lakeside exhibition hall will be set up and opened for the benefit of local and neighboring foundrymen on Saturday, May 14. The technical sessions held in the spacious meeting rooms of the public auditorium group of buildings will start Monday morning and conclude with the closing of the exhibition Thursday, May 19.

The central location of the convention city, the prominence of Cleveland as a castings center, with 118 foundries, making a wide diversity of all classes of castings, provides unusual facilities for plant visitation. The region of the lower great lakes is the metal working center of the United States and Cleveland is the focal point of production and use of castings.

MODERN PRODUCTION demands the most MODERN EQUIPMENT dependable 365 days of a year...



That is what you obtain when you install a

"CLEVELAND"

DUST COLLECTING SYSTEM

Modern engineers design it; experienced mechanics install it . . . and from then on it functions efficiently, dependably, and at low cost . . .

"28 Years in Business"

EFFICIENCY · INTEGRITY · SERVICE

The Cleveland Blow Pipe and Mfg. Co.

6505 Cedar Ave. . . . . Cleveland, Ohio

Fall Technical Foundry Conference to be Held at Battelle Institute

Sponsored by the American Foundrymen's Association in cooperation with Battelle Memorial Institute, a conference devoted entirely to technical subjects will be held at the Institute laboratories, Columbus, Ohio, September 30 and October 1. While differing in some measure from previous joint conferences of the Association arranged with technical schools, local chapters of its own and other engineering and educational societies, the program, which is nearing completion, will be directed along foundry metallurgical lines. Metallurgists and educators versed in the technical phases of foundry production will deliver papers under the three main headings of steel, non-ferrous and gray cast iron. Attendance and participation of the foremost authorities gives opportunity for a practical short course in these subjects to all interested.

Meetings of various A.F.A. committees are being scheduled for Thursday morning, and the formal program will be held Thursday afternoon and Friday. As an added attraction to those contemplating attendance at the conference, tickets may be reserved for the colorful Ohio State-Purdue game to be held in the Ohio State University stadium Saturday, October 2.

The tentative program of non-ferrous subjects is as follows:

Non-Ferrous Castings—Presiding, *Dr. H. W. Gillett*, Chief Tech. Advisor, Battelle Memorial Institute, Columbus.

(1) *Effects of Chromium in Copper Base Alloys.* Discussion leader—*Dr. Bruce Gonser*, Supervising Metallurgist, Battelle Memorial Institute, Columbus, Ohio.

(2) *Melting methods in the Non-Ferrous Casting Industry.* Discussion leader—*Harry M. St. John*, Metallurgist, Detroit Lubricator Co., Detroit, Mich.

A dinner with short addresses will be held Friday evening at one of the downtown hotels, the noon luncheon that day being staged at the Institute. A special inspection tour of the numerous research laboratories of the Institute will be made Saturday morning. Dr. C. H. Lorig and C. E. Sims of the Institute are in charge of the general local arrangements for the conference.

For those remaining Saturday afternoon, tickets should be reserved as soon as possible through Dr. C. H. Lorig, Battelle Memorial Institute, Columbus, Ohio.

While Columbus has many hotels, those planning to attend are urged to make reservations as soon as possible. Hotels suggested are the Deschler-Wallick, The Neil House, Seneca, Virginia, Fort Hayes and the Chittenden.

St. Louis Chapter Plans Regional Foundry Conference for Rolla, Mo.

The Missouri School of Mines and Metallurgy will be host to foundrymen of the southwest who attend the regional foundry conference, October 8 and 9. This conference, which is being sponsored by the St. Louis Chapter of the American Foundrymen's Association in cooperation with the School of Mines, will be held in the buildings of the school at Rolla, and will cover various subjects of current interest to all groups of foundrymen. All foundrymen and others interested are cordially invited to attend.

Some of the papers are listed below.

Sand Control Program in the Foundry, Harry W. Dietert, Harry W. Dietert Co., Detroit, Mich.

Sand Reclamation, Sand Conditioning and Sand Control, L. B. Knight, Jr., National Engineering Co., Chicago, Ill.

Sources of Molding Sand for Foundries in Missouri, Dr. H. A. Buehler, State Geologist, Missouri School of Mines.

Relation Between Molding Sands and Casting Defects, C. F. Bunting, Southern Malleable Iron Co., E. St. Louis, Illinois.

Lining of Reservoirs and Ladles Suitable for Soda-Ash Treatment, J. J. Offutt, A. P. Green Fire Brick Co., Mexico, Mo.

Bonds and Grouts, L. C. Hewitt, Lacledé-Christy Clay Products Co., St. Louis, Mo.

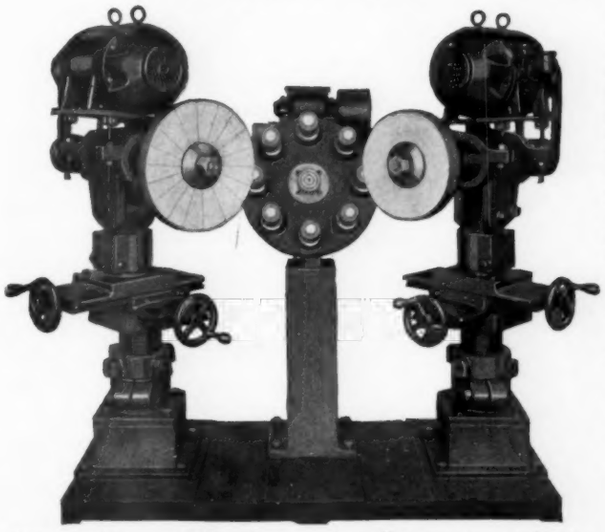
Linings for Annealing Ovens and Non-Ferrous Metal Furnaces, Geo. D. Cobough, Harbison Walker Refractories Co., St. Louis, Mo.

Non-Ferrous Metals and Alloys, A. Fritschle, Federated Metals Div., Amer. Smelting & Refining Co., St. Louis, Mo.

Insulation, Operation and Maintenance of Non-Ferrous Metal Furnaces, P. J. Myall, Fisher Furnace Co., Chicago, Ill.

"Use of Plastic Bronzes in Modern Bearing Applications," by Claude C. Morgan, Vice President, Bronzoid Corporation, Dallas, Texas.

Acme AUTOMATIC TYPE "L-8" 2-Wheel Unit POLISHING AND BUFFING MACHINE



An eight-spindle Automatic Indexing Machine combined with two adjustable lathes, designed to perform two operations in a single loading; such as, cutting down and coloring, polishing and buffing, or to finish parts that require both a face and side wheel contact. It will handle small stampings, die castings and other parts up to 6½" in diameter.

The two spindles opposite the buffing wheels revolve, while the three lower spindles remain stationary for loading. It has a standard indexing speed of 1200 indexings per hour, although some installations are indexing up to 2100 per hour, with slower speed obtained through an adjustment on a cone pulley.

The lathes are V-belt driven and equipped with either three or five H.P. totally enclosed fan-cooled motors, and have all the necessary adjustments for quick set-up and wheel wear. The indexing head is equipped with a ½ H.P. motor.

Chucks used for holding the work are of the automatic grip and release type, allowing the operator ample time to load and properly tend to the wheels.

The machine takes slightly more floor space than an ordinary lathe, and produces savings that pay for itself in a very short time.

•

Net weight approximately 1900 lbs. Floor space 32" x 64"

SPECIAL MACHINERY AMC AUTOMATIC BUFFING MACHINES

ACME MANUFACTURING COMPANY
DETROIT . . . . . MICHIGAN
BUILDERS OF AUTOMATIC POLISHING AND BUFFING MACHINES FOR OVER 25 YEARS

Electrochemical Society

COLUMBIA UNIVERSITY, N. Y.

The 72nd meeting of the Society will be held in St. Louis, Mo., October 13-16, at the Hotel Chase. Among the papers to be read are the following:

"*Electrothermic Distillation of Metals*," by Walter S. Landis, American Cyanamid Company, New York City.

"*Electrolytic Production of Beryllium Copper Alloys*," by Colin G. Fink and T. N. Shen, Columbia University, New York City.

"*Industrial pH Control with the Antimony Electrode*," by W. N. Greer, Leeds & Northrup Company, Philadelphia, Pa.

"*Electrochemical Protection of Iron from Corrosion in Alkalies*," by W. W. Stender and B. P. Artamonow, Leningrad, U. S. S. R.

Dust Control Equipment Assn.

PENTON BLDG., CLEVELAND, O.

The Dust Control Equipment Association at its meeting in Cleveland early in June gave careful attention to reports from the Engineering Committee of the association dealing with work in establishing standards of dust control practice, the need for which has existed for quite some time.

The association endorsed the recommendations of the engineering committee with regard to the adoption of a friction chart and the development of a formula for use in connection with that chart.

During the meeting the association was addressed by *Theo. Hatch*, Associate Dust Control Engineer, Division of Industrial Hygiene, Department of Labor, State of New York, on the subject "*Importance of Modern Standards and Methods of Dust Analysis upon Design and Efficiency of Dust Control Equipment.*"

National Battery Manufacturers Assn.

7 EAST 44TH STREET, NEW YORK, N. Y.

The thirteenth annual convention of the National Battery Manufacturers Association is scheduled to be held [illegible] the Sherman Hotel in Chicago, October [illegible], 11 and 12, 1937.

Sunday, October 10 has been reserved for an Association Golf Tournament.

All members of the industry are cordially invited to attend the two-day business session, Monday and Tuesday, October 11 and 12.

Porcelain Enamel Institute

612 N. MICHIGAN AVE., CHICAGO, ILLINOIS

There have been many outstanding events and periods in the porcelain enameling industry's history, but none any more so than the week of October 11, according to predictions made by the Porcelain Enamel Institute. This week will be divided into two outstanding features—

1. Seventh Annual Meeting of the Porcelain Enamel Institute in Chicago, October 11 and 12.

2. Second Porcelain Enamel Institute Forum at the Ohio State University, Columbus, Ohio, October 13, 14 and 15.

Tentative Program

WEDNESDAY, OCTOBER 13

Address of Welcome
Response
Summary of Porcelain Enamel Institute Activities and Plans for 1938
Workable Control Systems and Benefits to the Enamel Plant

THURSDAY, OCTOBER 14

9:30 A. M.

Enamel Shop Costs
Simple and Practical Incentive Systems for Enamel Shops
Safety in the Enamel Plant
Plant Maintenance

1:30 P. M.

Welding
Drawing and Cleaning Compounds
Nickel Treatment of Enameling Iron
Enamel Process Inspection and Repair

Thursday Evening—
Dinner and Entertainment

FRIDAY, OCTOBER 15

9:30 A. M.

Colors and Color Matching
Structural Porcelain Enamel
Silk Screen Process
Drawing

1:30 P. M.

Hollow Ware

Pickle Room Practice, Part II
Control and Consistency of Enamels for Dipping
(Two additional subjects to be selected)

Sheet Iron

Collection, Handling and Use of Reclaimed Enamels
Ground Coat Dipping
Cleaning and Pickling Practice
Control and Consistency of Enamels for Spraying.

British Institute of Metals

36 VICTORIA ST., LONDON, S. W. 1, ENGLAND

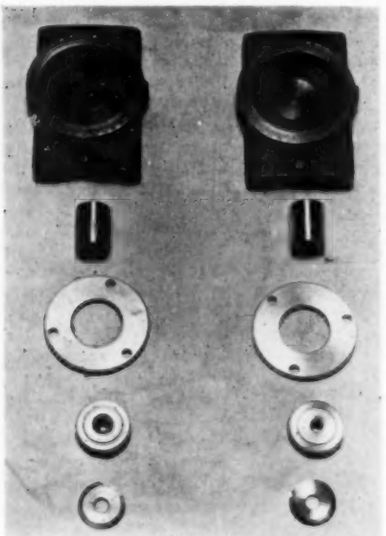
The 29th Annual Autumn Meeting will be held in Sheffield, England, September

Naptha and Brushing Eliminated!

A large tool and equipment manufacturer was using naptha to remove cutting oil and chips from cast iron and steel parts.

These parts are now cleaned with MAGNUS No. 78 (a new product), then simply rinsed. Not only is the dangerous fire hazard eliminated and better cleaning results obtained — but the labor of brushing the cast iron parts, is likewise done away with. Another feature is the fact that the cleaner is used at room temperature, eliminating all need of heating for the cleaning operation.

An unretouched photo showing parts before and after cleaning with MAGNUS No. 78.



Metal working manufacturers everywhere are looking into the many favorable features of MAGNUS No. 78, the new emulsion degreasing liquid for the cold cleaning of metals. It combines solvent degreasing with soap washing, giving results that are better than either alone.

Write today for full details about MAGNUS No. 78 for precleaning. Or, without obligation, we'll gladly send you a drum of this material on trial. Our money-back 30-day guarantee fully covers you.

MAGNUS CHEMICAL COMPANY

Manufacturers of Cleaning Materials, Industrial Soaps, Metallic Soaps, Sulfonated Oils, Emulsifying Agents and Metal Working Lubricants.

11 South Avenue Garwood, N. J.

MAGNUS CLEANERS

6-9, 1937. The papers to be presented are as follows:

Copper-Rich Nickel-Aluminum-Copper Alloys. Part I.—The Effect of Heat-Treatment on Hardness and Electrical Resistivity, by W. O. Alexander and D. Hanson.

The Constitution of the Nickel-Aluminum System, by W. O. Alexander and N. B. Vaughan.

The Methods of Testing Zinc Coatings, by L. Kenworthy.

The Mechanical Properties of Some Metals and Alloys Broken at Ultra High Speeds, by D. W. Ginns.

Precision Extensometer Measurements on Tin, by B. Chalmers.

Alloys of Magnesium. Part VI.—The Constitution of the Magnesium-Rich Alloys of Magnesium and Calcium, by J. L. Haughton.

A Study of the Deformation of the Macrostructure of Two-Phase Alloys by Cold Rolling, by H. A. Unckel.

The Transformation in the Beta Brasses, by C. Sykes and H. Wilkinson.

A Study of the Mechanical Properties of Tin-Rich Antimony-Cadmium-Tin Alloys, by D. Hanson and W. T. Pell-Walpole.

The Determination of Alumina in the Presence of Metallic Aluminum, by G. B. Brook and A. G. Waddington.

The Constitution of Tin-Rich Antimony-Cadmium-Tin Alloys, by D. Hanson and W. T. Pell-Walpole.

The Constitution of the Copper-Gallium Alloys in the Region 18 *to* 32 *Atomic Per Cent. Gallium*, by W. Hume-Rothery and G. V. Raynor.

International Acetylene Association

30 E. 42ND STREET, NEW YORK

The International Acetylene Association will hold its 38th Annual Convention in Birmingham, Alabama, November 10, 11, and 12. Headquarters for the convention will be the Hotel Tutwiler.

Technical sessions will be held each afternoon. The oxy-acetylene process for welding and cutting metals will be featured at all these sessions.

American Chemical Society

706 MILLS BLDG., WASHINGTON, D. C.

A meeting of the American Chemical Society, is to be held in Rochester, N. Y., September 6-10, 1937. Among the papers to be presented before the Division of Industrial and Engineering Chemistry are:

The System, Gallium-Indium, by Sidney J. French, Donald J. Saunders and George W. Ingle.

Further Studies of the Probability of Corrosion, by R. B. Mears and R. H. Brown.

The Wire Association

17 E. 42ND STREET, NEW YORK

The 1937 Meeting and Exhibition of the Wire Association will be held in Atlantic City, N. J., October 18-22 in association with the National Metal Congress. Among the papers on non-ferrous subjects to be presented are the following:

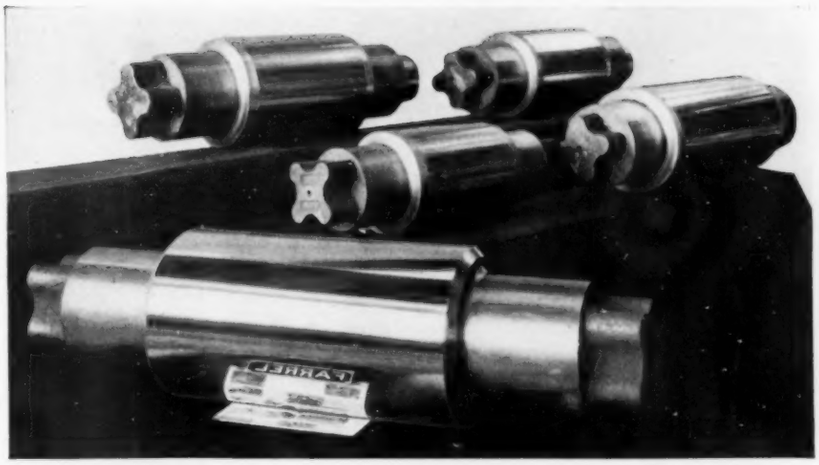
Production of Copper from Mine to Mill, by Wm. H. Bassett, Jr., manager, Metallurgical Development, Anaconda Wire & Cable Co., Hastings-on-Hudson, N. Y.

The Metallurgical Aspects of Fourdrinier Wire, by Hugh E. Brown, Director of Research, W. S. Tyler Co., Cleveland, Ohio.

The Need of a Better Quality of Copper in Apparatus Manufacture, by L. H. Burnham, Engineer Transportation Division, General Electric Co., Pittsfield, Mass.

A Metallurgical Study of the Factors Affecting the Quality of Galvanizing, by R. W. Sandelin, chief metallurgist, Atlantic Steel Co., Atlanta, Ga.

High Nickel Alloys in the Field of Wire and Wire Products, by Carl Rolle, Development and Research Division, International Nickel Co., Inc., 67 Wall Street, New York.



FARREL NI-HARD ROLLS
PRODUCE BETTER FINISH SHEETS

The surface of rolled sheets can be no better than the surface of the rolls on which the sheets are produced. Farrel Ni-Hard Rolls are ideal for high finish sheets as they produce a higher quality finish, their life is longer and cost per ton of output is lower. Farrel Ni-Hard Rolls combine a hardness of 80 to 90 scleroscope with high strength and a flawless surface. Note the highly reflective surface of the Farrel Ni-Hard Rolls shown in the unretouched photograph above.

Farrel Rolls are made in several grades, including Sand, Cupola Chilled Iron, Electric Furnace Chilled Alloy Iron, Heat-Treated Farrel Ni-Hard, Farrel-Erler and Steel.

Over seventy-five years' experience in designing and manufacturing rolls for a broad variety of uses . . . . . unexcelled plant facilities . . . . . modern equipment . . . . . skilled technicians in metallurgy and engineering . . . . . founders and machinists trained in specialized roll manufacture . . . . . make an effective combination for producing rolls of superior quality, precision and durability.

Farrel-Birmingham Rolling Mill Equipment includes: Rolls—Rolling Mills—Rod Mill Tables and Manipulating Equipment—Universal Mill Spindles—Rod Coilers—Lead Presses for Pipe or Rod—Roll Grinding Machines—Roll Calipers—Gears—Mill Pinions—Pinion Stands—Drives up to 10,000 H.P.—Flexible Couplings.

FARREL-BIRMINGHAM
Company, Inc.
201 Main St., Ansonia, Conn.

Exposition of Chemical Industries

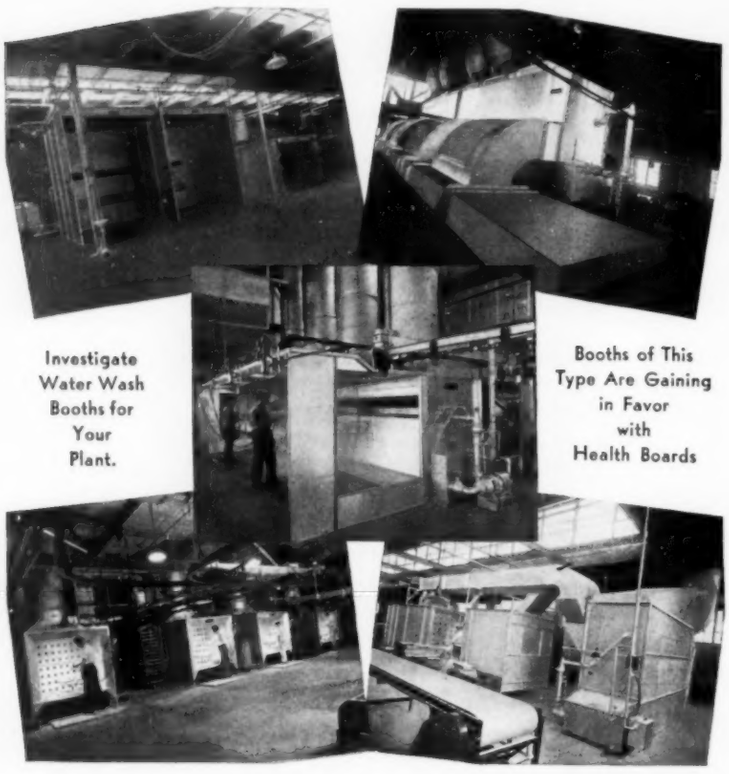
GRAND CENTRAL PALACE, NEW YORK

The 16th Exposition of Chemical Industries will be held at Grand Central Palace, New York, December 6-11, 1937. The exhibits will include chemicals of all varieties and equipment and supplies.

Full information can be obtained from Chas. F. Roth, Director, Grand Central Palace, N. Y.

OUTSTANDING BINKS WATER WASH SPRAY BOOTH INSTALLATIONS

Below are illustrated a few of the many Binks Water Wash Booths installations which are cleansing exhaust air for their users by the air wash method.



Investigate Water Wash Booths for Your Plant.

Booths of This Type Are Gaining in Favor with Health Boards

Our Engineers Will Gladly Quote After a Survey of Your Plant Needs. Write Today!

BINKS MANUFACTURING COMPANY

3114-40 CARROLL AVENUE CHICAGO, ILLINOIS

BORDEN C. WRIGHT

For these years of busy days,
And especially to their foreman Borden Wright.

For he has worked for Musick's for 50 of these years
Every day upon the job without a shirk
And that's why we're here tonight,
To honor Borden Wright
For 50 years of faithful, honest work.

He does the special finishes; he's always on the job.
(I speak the truth right in this little sonnet),
And he sees everyday
That Gabby gets the work away
Without a single finger print upon it.

We wish him health and happiness in all the years to come.
A long and happy future is in sight.
May the days that are before
Have lots of joy in store
For all his life he's tried to make things bright.

Personals

Borden C. Wright

Borden C. Wright was the guest of honor at a dinner tendered him by the Musick Plating, Inc., 206 S. 9th St., St. Louis, Mo., on August 14, to celebrate his 50th anniversary in the service of the company.

Mr. Wright, who at the age of 18 took a "temporary" job at 6c per hour with the Musick Plating Co., Inc., has not missed more than one week's time since then because of illness. Since starting on his "temporary job" he has worked in every department of the plant. He still wears overalls and hustles as fast as any boy or man in the organization. He states that he is good for 25 more years as foreman of the Special Finishing Dept.

Mr. Wright was presented with a gold placque by E. J. Musick, president of the company, from the officers and employees, as a token of their esteem and friendship. Hedley J. Richards, the well known "Poet Laureate" of the American Electro-Platers' Society, was one of the guests at the dinner and read the following original poem in Mr. Wright's honor:

Borden C. Wright

In the city of St. Louis at 206 South Ninth Street,
Is a place where you can take work to be plated,
In a shop designed and made
Just expressly for their trade,
Built by Musick Plating, Inc.

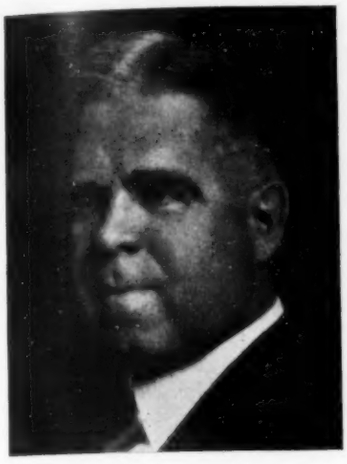
They've been in business in this line for 56 long years;
Good work is their aim and their delight.
To their men they give due praise

Prof. A. E. White

Dr. A. E. White, Professor of Metallurgical Engineering, and Director, Department of Engineering Research, University of Michigan, Ann Arbor, Mich., is the president for the 1937-8 of the American Society for Testing Materials.

Following his graduation from Brown University, 1907, and a year of study at Harvard, 1908, Doctor White was in charge of research on blast-furnace by-products, ores, etc., for Jones & Laughlin Steel Co. In 1911 he became instructor at the University of Michigan, assistant professor 1913-1917. He has held his present position since 1919. From 1917 to 1919 he served in the Ordnance Department, U. S. A.—was head of the Metallurgical Branch, Inspection Division and also head of the Metallurgical Branch Technical Staff. He is now Lieutenant-Colonel, Ordnance Reserve Corps. Doctor White is active in the work of several A.S.T.M. committees in the

metals fields and chairman of the steel committee's group on materials for high-temperature service. He was the first president of the American Society for Metals and is a past-chairman of the research com-



PROF. A. E. WHITE

mittee, American Society of Mechanical Engineers. In 1925 Brown University awarded him the honorary degree of Doctor of Science. From 1933 to 1935 he was a member of the A.S.T.M. Executive Committee and is completing a term as Vice-President, 1935-1937.

Obituaries

Emil Troxler

Emil Troxler, Metropolitan representative for the Matchless Metal Polish Co., Glen Ridge, N. J., for the last 11 years, died on Friday, August 6, 1937, following a sudden heart attack.

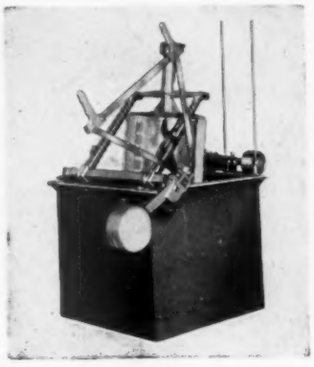
Mr. Troxler was born in Newark, N. J., September 1, 1880. Almost his whole business life was devoted to the metal finishing industry. He had been foreman plater for the Dingwall Co., Winnipeg, Canada; foreman of the plating dept. of Bastian Bros., Rochester, N. Y.; salesman for the Nicholas Lacquer Co., Chicago, Ill. At one time he taught chemistry in the Newark, N. J. Technical High School. Mr. Troxler was consequently very well informed on electroplating and metal finishing in general. He was widely and favorably known throughout the industry.

Mr. Troxler was a member of a number of business, civic and fraternal organizations, including the following: N. Y. Branch A.E.S.; N. Y. Local, Polishers and Buffers Union; United Commercial Travelers' of America; Eastern Commercial Travelers; Good Fellows' Association; Gen. John A. Dix Council, Jr., O.U.A.M.

Mr. Troxler leaves a widow, Mrs. Mary Grennon Troxler, of 49 Mertz Ave., Belleville, N. J., a foster son, Gordon Grennon, and a brother, Gustave Troxler of Newark, N. J.

DANIELS PLATING MACHINES Patent No. 1936382

Designed to reduce the cost of plating small articles in bulk



TYPE O.L.S. Made in Four Sizes

THE machine is built strong and operates rapidly due to a novel feature in the designing of the conductor frame. The frame has a four point contact so placed in the bottom of the container that the current is equally distributed to all articles being plated. The result is a uniform deposit; eliminates the depositing or treeing of metal on any part of the machine.

DANIELS PLATING MACHINE CO., INC.
129 Oliver Street, Newark, N. J.

WATER WHITE LACQUER COOPLAC NO. 82

● Adds distinction and longer life to your product. Will not crack or curl in cold weather, or become tacky in moist humid weather, and does not darken with age.

Recommended for:
Gold, silver and other metals, plated articles, hardware, buckles, hinges, etc.

An exceptional value, let us quote you. Also a full line of Platers' Chemicals.

COOPER'S CERTIFIED CHEMICALS

Works, Newark, N. J.
Established 1857

CHARLES COOPER & COMPANY
196 WORTH STREET, NEW YORK, N. Y.

EMIL TROXLER

William J. Burkert

William J. Burkert, secretary-treasurer of the Trenton Brass & Machine Co., Trenton, died July 29 at his home, 1534 Pennington Road, Trenton, after a long illness at the age of 54. He was a member of the Trenton Chamber of Commerce and was connected with the brass concern for more than 25 years.

Mr. Burkert was a member of the Rotary Club and Masonic Fraternity. He is survived by his wife, a daughter, three sisters and five brothers. Burial was at Trenton.—C. A. L.

Jordan Korp

Jordan Korp, of the Leeds & Northrup Company, died of a heart attack at his home in Philadelphia, August 10.

He was born in Christiana, Norway, in 1873. In 1904 Mr. Korp, in competition

HARD CLEANING PROBLEMS

Meet their Match in PERMAG

—at least that's the *record*, so far. But should a metal fabricator have a cleaning job he thinks will stick PERMAG and Magnuson Service, we would like nothing better than to hear of it.

Magnuson research, backed by so many years of practical and active experience, soon finds the satisfactory answer to cleaning difficulties. Hundreds of customers will back that statement. So if you have a problem, Write us. Put it up to PERMAG!

FOR QUALITY - PLUS PERMAG CLEANERS LEAD TRADE MARK REG. U.S. PAT. OFF.

MAGNUSON PRODUCTS CORPORATION

Manufacturers of
Specialized Scientific Cleaning Compounds for Every Industrial Purpose
Third & Hoyt Sts. Brooklyn, N. Y.

Warehouses in principal cities throughout the U. S.
Representatives from coast to coast.
Canadian concerns please contact Canadian PERMAG Products Ltd.
Ottawa & Queen Sts., Montreal, P. Q. Canada.

Bring up the highest possible lustre either before or after plating by using ROUGE!

Specify BURNSROUGE

All types for all purposes

Red stick—for sterling or plating.
White stick—for white alloys, optical goods.
Black stick—sterling—lamp reflectors.
Green stick—platinum.
"Colorchrome"—chromium plate.
"Steelshine"—stainless steel, monel, etc.

Finest raw materials—expertly compounded—saponifiable binders—uniform—non-scratching.

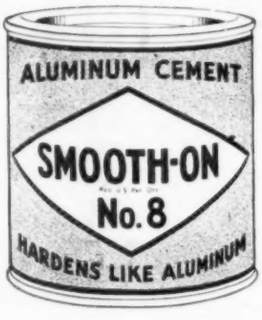
BETTER CHECK UP ON THESE ROUGES—Samples free, if you will advise details of operation, metal, wheel speed and finish.

Since E. Reed Burns 1888

E. REED BURNS Mfg. Corp.

Plant & Office 21-27 Jackson Street
Warehouse 40-42 Withers Street
Brooklyn, N. Y.

Filling cement for ALUMINUM
SMOOTH-ON NO. 8



THIS cement is easily applied, adheres and hardens well, matches the color and surface texture of the surrounding metal, and can be filed, machined or polished to a fine finish.

As a filling for holes, rough surface or porous spots on castings, and for seams, cracks and open spaces between assembled parts, this composition gives the same satisfaction on aluminum as do the three grades of Smooth-On No. 4 Iron Cement on iron and steel surfaces.

The first application will prove its desirability for the purposes intended, and the saving of a few otherwise rejected pieces pays for all the cement required in a year. Make the trial and be convinced. The cost is almost nothing. Get free samples and see for yourself.

Buy Smooth-On No. 8 in ¼-lb. or 1-lb. can.

SMOOTH-ON MFG. CO., Dept. 18, 568-574 Communipaw Ave., Jersey City, N. J.

Do it with **SMOOTH-ON**

with other young men throughout Norway, was selected by the Norwegian government as one of those to come to the United States for a post-graduate course in his trade as toolmaker. He returned to Norway in 1904, made his report and discharged his obligations. He then returned to the United States, became a citizen, and took a position as toolmaker for the Leeds & Northrup Company, soon becoming foreman of the toolroom.

Alfred Wilm

The discoverer of duralumin, Professor Alfred Wilm, died August 10 at the age of 68.

He was a member of the engineering faculty at Goettingen University, Germany, where he took over the studies of Professor Woehler, discoverer of aluminum.

Andrew W. Mellon

Andrew W. Mellon, secretary of the Treasury in the cabinets of Presidents Harding, Coolidge and Hoover, former ambassador to Great Britain and one of the leading industrialists in the United States, died in Southampton, L. I., August 26th. He was 82 years old.

Mr. Mellon was one of the pioneers in building up the Aluminum Company of America. He was internationally known as well for his benefactions. Among his non-remunerative aids to industry was the Mellon Institute of Pittsburgh, Pa. for industrial research, which he helped to found.

William F. Guilfoile

As noted in our August issue, William F. Guilfoile died July 29 of a heart attack. He had been for the past 20 years, foreman in the plating department of the Waterbury Patent Button Co. of Waterbury, Conn.

Mr. Guilfoile was one of the prominent members of the American Electro-Plater's Society, being secretary-treasurer of the Waterbury Branch. He was also active in local fraternal circles, being second ranking officer in the Sheridan Council 24, Knights of Columbus, for whom he had been Recording Secretary for 25 years. He had also been financial secretary of Court Oregon 138, Foresters of America, and secretary of St. Joseph's T.A.B. Society when they were active in promoting temperance work in Waterbury.

Mr. Guilfoile leaves a widow, Mrs. Stasia Hughes Guilfoile, a daughter Betty, a son William F. Guilfoile, Jr., one brother and seven sisters.

News from Field Correspondents

Waterbury, Conn.

August 20, 1937.

The *Scovill Mfg. Co.* has purchased the *Vulcanite Mfg. Co.* of Lindenhurst, Long Island. The plant is being dismantled and its business in the future will be handled by the *Oakville Co. Division* of the *Scovill Co.* of this city. Some of the machinery will be moved here. The *Vulcanite Co.* em-

ployed about 50, a few of whom will come to this city. *N. T. Porter,* the former owner, wished to retire. The products of the company are similar to some produced by the *Oakville Co. Division.*

Charles D. Palmer, for more than 30 years, one of the country's best known salesmen of brass and copper goods, retired this month as sales manager of the *French Mfg. Co.,* a subsidiary of the *American Brass Co.* He still continues as president of the *Palmer Brass & Copper Co.,* of New York, but has turned over all his active duties with that concern to *Robert Beers,* formerly of this city, who is now general manager of the company.

He entered the employ of the old *Benedict & Burnham Co.* in 1901, a year later was made assistant superintendent of the mill under *Frederick W. French.* When the latter organized the *French Mfg. Co.* he became its sales manager with his office in New York. He continued in that position after the *American Brass Co.* acquired the company. In 1921 he started the *Palmer Brass & Copper Co.,* a sales agency, which now has a large warehouse at Bedford and Putnam Avenues in Brooklyn. He started with a small stock of tubing but the company now carries large quantities of all kinds of brass and copper goods to supply rush orders in the New York section. He will retire to the farm he recently purchased in Woodbury, Conn.

Formation of the *Metal Workers' Association* with an initial membership of 1,000, was started this month by employes of the *American Brass Co.* The *Waterbury Brass Workers Union,* a CIO affiliate, has been trying to organize the employes of this plant. Leaders of the *Metal Workers' Association* say that if they enroll 1,000 more members the association will then have to be recognized as the bargaining agent of the concern's employes. The Association was launched at a mass meeting at Buckingham hall at which the president, *Howard Branch,* pointed out the advantage of joining the Association rather than any of the usual labor organizations, because its dues are only $1 a year while the dues of other organizations are much higher, most of them going to organizers and national organization headquarters.

"We will not tolerate interference by outside organizers in our affairs," he said. "This Association is for and by the employes and no company official, foreman, or any one who has power to hire or fire will be allowed to join or have any voice in its affairs." It is understood that plans are being made to form similar organizations in the *Scovill Mfg. Co.* and *Chase Brass & Copper Co.*

The *Waterbury Brass Workers Union,* at a meeting this month, stated that in eight months of activity it had received recognition in seven local plants; the *Waterbury Buckle Co., Waterbury Battery Co., Shoe Hardware Co., Waterbury Mfg. Co.,* a subsidiary of the *Chase Brass & Copper Co.,* and partially in the *American Brass Co., Scovill Mfg. Co.* and *Chase Co.*—W. R. B.

Connecticut Notes

August 20, 1937.

TERRYVILLE. An attempt to oust the present management of the *Eagle Lock Co.*

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has been launched by the brokerage firm of *Thornton & Curtis* of Boston, who state that they represent the two largest stock interests. It is seeking proxies of the stockholders as is the present management which consists of President *H. G. Plumb*, Treasurer *O. B. Hough* and *H. C. Clough* as the proxy committee. The annual meeting will be held August 18.

The controversy brought out the fact that the management and directors own less than 10 per cent of the stock. In the past, the management which has been ultra conservative, has never issued public statements of its financial condition; only one typewritten copy at each stockholders meeting and stockholders were not allowed to copy it. The *Thornton & Curtis* firm have criticized the operating losses of the company in recent years and declare it is due to lack of aggressiveness in the management. They also criticize the low valuation placed on the assets by the management.

The management, in reply, states that it is unwilling to make heavy investments in attempts to manufacture new products foreign to its business which seem to have little chance of profit. The operating losses, it said, were met from accumulated reserves and dividends were paid as before. An increased volume of business is being received, it said, which compares favorably with that of competitors. Probably as a result of this controversy the company has issued an earning statement, showing an operating loss of $41,000 for the year ending June 30, compared with a loss of $70,000 the previous year; dividends paid of $78,266; a surplus of $225,048 compared with $285,142 a year ago. The statement also showed the current market values of the securities held, something that has never been done before.

BRISTOL. William P. Garrett, regional director of the CIO has been holding several meetings seeking to enroll employes of the *E. Ingraham Co.* in the CIO. The plant has about 2,500 employes. It was closed for one week for the annual vacation beginning August 1.

BRIDGEPORT. Employes of the *Bryant Electric Co.* voted 779 to 269, to accept the CIO as the sole bargaining agency for them. The election was conducted by the NLRB on petition of the *United Electrical and Radio Workers.* About 75 per cent of the employes were represented.

HARTFORD. Directors of the *Veeder-Root, Inc.* have called a special meeting of the stockholders for October 15 to vote on increasing the number of shares from 100,000 of a stated value of $25 to 400,000, and to issue 100,000 of the new authorization at a stated value of $12.50. President *Graham H. Anthony* reported that the company's net earnings for the past year were $7.24 a share, which would be $5.43 a share under the new set-up. Earnings the previous year were 4.11 a share on the old set-up.

NEW BRITAIN. The *Stanley Works* have bought 148 acres in the Great Salt Meadows section of Stratford where it plans to erect a factory. It now owns the *American Stamping Co.* of Bridgeport which is nearby.

MERIDEN. Manning Bowman & Co. have authorized an additional stock issue of 27,932 shares at $10 a share. Proceeds

from the sale will be used to reduce bank indebtedness now amounting to $400,000.

TORRINGTON. Stockholders of the *Hendey Machine Co.* will meet August 23 to act on a motion rescinding the previous vote to authorize 18,000 shares of Class B stock at $20 a share and to act on a motion to authorize the issuance of 50,000 shares of this stock at such price as the directors see fit, the stockholders to be given first choice.—W. R. B.

Providence, R. I.

August 20, 1937.

Total corporation tax revenues for the State attained their highest peak in seven years, soaring to $695,792.43 which is an increase over the 1936 returns of $234,200.68. Better business conditions throughout the State and a revaluation of ratable corporate values are held responsible for the gain.

According to statistics compiled by the State Director of Labor and released a few days ago, employment in 288 manufacturing establishments in Rhode Island during the month of June increased nearly 10 per cent from June a year ago. But the gain shown by the 36 metal trades concerns reporting was much more encouraging, being nearly treble that of the general improvement with its 28.3 per cent over the June, 1936 figure although only 1.7 per cent increase over the preceding month of May.

The *Ferguson Perforating & Wire Company*, of Providence, has been incorporated with capital consisting of 250 shares of common stock of no par value. The incorporators are: *J. Cecil Ferguson*, of 80 Glenwood Avenue, Pawtucket, *Theodore F. Ferguson* and *Raymond J. McMahon*. The company has been granted a permit for the erection of a one-story brick manufacturing building on Ernest Street, 421 x 92 feet and will cost $10,500.

The *L & G Manufacturing Company*, 112 Point Street is owned by *Isidor Leitner* of 98 Orms Street.

The *L. G. Balfour Company* is erecting a two-story addition to its jewelry manufacturing plant, 80' x 30' on County Street, Attleboro, at an estimated cost of $14,000. The new building will be used for enlarging the trophy department and for die and tool cutting space, with prospect of additional employes being added when it is completed, early in September.

John Leach of 156 Gallatin Street is owner of the *Union Smelting & Refining Works* and of the *General Scrap Products Company*, at 116 Point Street.

George W. Montagano, of 269 Greenville Avenue, Johnston, is owner of the *Crown Hard Enameling Company* at 140 Chestnut Street, Providence.

The annual outing and field day of the *New England Foundrymen's Association* was held August 11 at the grounds of Pomham Club on the east shore of Narragansett Bay about six miles from Providence. Arriving at the club about noon, lunch was served, after which the nearly 150 members spent the afternoon in bowling, clock golf, billiards and playing bridge. At 4 o'clock a shore dinner was served followed by a vaudeville floor show. The officers of the organization

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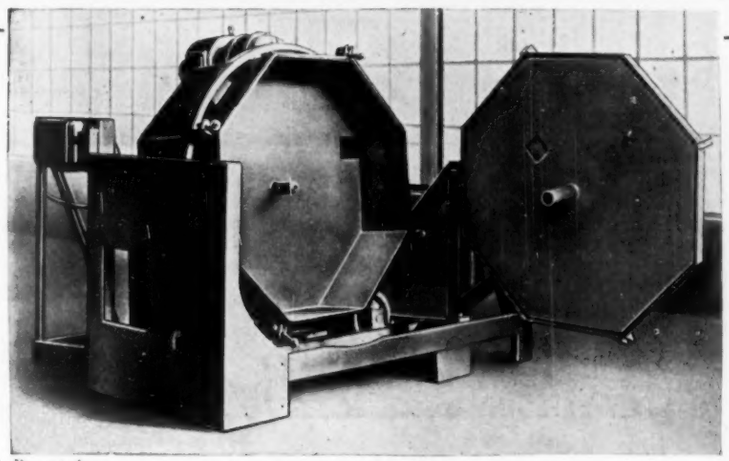

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METROPOLITAN — WESTERN — PHILADELPHIA

are: *Walter M. Saunders*, president; and *Ernest F. Stockwell* of Cambridge, Mass., secretary. The affair was arranged by a committee consisting of *Fred B. Clark*, *Fred W. Oldfield* and *W. G. Rich*.—W. H. M.

Utica, N. Y.

August 20, 1937.

Activity in Central New York metal trades continued on an even keel through July without any unusual upsets or without any large size orders reported to the *Industrial Association of Utica*. Industrial employment in Utica showed a total of 22,504 at work in July of this year compared with 20,119 at the same time last year. Bank clearings in Utica were $4,324,587 this July compared with $3,403,435 for July 1936.

The 4,500 employes of *Remington Arms and Remington Rand* at Ilion were on vacation until the middle of August. Employes who were on the payroll for one year continuously were given two weeks with pay. The annual shutdown marked the 121st birthday of the organization. *Eliphalet Remington* forged the first Remington rifle in Ilion in August 1816.

The 160 striking employes of the *Lewis-Weller Manufacturing Company* in Utica where springs for beds are made continued to strike in August. The employes are striking because their employers have refused to sign the CIO agreement. *William L. Lewis* is plant president.

Other plants in Utica, Rome and the Mohawk Valley towns were reported to be operating without the labor troubles which have been reported in other metal centers.—E. K. B.

Newark, N. J.

August 20, 1937.

Schnefel Bros. Corp., 684-90 South 17th Street, is erecting a three-story plant addition for the manufacture of various kinds of cutlery. The concern was started in 1903 and is headed by *Max Schnefel*, of East Orange.

The *New Jersey Electric Supply Co.*, of this city, is confronted with a Federal Court suit charging infringement of three patents on portable reading lamps. The *Faries Mfg. Co.*, of Decatur, Ill., alleges it is the sole owner of three patents assigned to it by the inventor, *Bert A. Dickerson*. The *Faries Co.*, is seeking an injunction, an accounting and damages.

The *Home Electric Appliance Co.* has leased a plant on Central Avenue.

The *Jersey Electric Clock Co.*, of Jersey City, will shortly reorganize following a Federal Court litigation. The *Beller Electric Supply Co.*, has leased a factory building on Bruen Street.

Vice Chancellor Stein has signed an order approving the report of a special master on the dissolution and liquidation of the *Splitdorf Electric Co.* The trustees reported a balance on hand of $75,248.19. When the trustees took over in 1932, the company had cash on hand of $42,441. This was subsequently raised to $822,859, most of which has already been distributed in dividends.—C. A. L.

Trenton, N. J.

August 20, 1937.

The strike at the plant of the *Roller Bearing Company of America* at Trenton was ended late in July when a group of employes decided to return to work. About 100 of the 150 striking employes returned after the plant had been tied up for six weeks. Confusion over organizing of employes figured in the strike situation. Rival unions fought for supremacy with the CIO winning an election to settle the question. Company officials said they would confer on the unsettled demands. The company, however, granted 5 cents an hour wage increase before the strike began. The other employes remaining out will be given jobs later.—C. A. L.

Detroit, Mich.

August 20, 1937.

Industrial conditions have been holding up well of late, even if it is midsummer. Some of the big motor car plants stopped production for a brief period, but most of them are back again and making plans for the early fall.

Most of the big motor car plants are planning for heavy fall production. Stock is being purchased and new equipment and machinery installed. It is expected the coming months will witness a great revival. Much of this apparently being due to less apprehension from labor difficulties.

Accessory manufacturers are equally confident for the future. Many of them even now are increasing production.

Producers of refrigeration units are just as busy as ever, with every one looking for increased activities as the fall continues to advance.

Manufacturing jewelers, however, are only moderately active. They still have a long way to go before being back to normal.

Plating plants are making substantial progress. Most of them, apparently, will be operating to capacity within a short time.

Sleeper Coaches, Inc., is a new Detroit organization headed by *Paul W. Seiler*, former president of the *General Motors Truck Co.* which has just introduced a new type of sleeper bus. Designed by *H. G. McCarroll*, in association with *Le Roy G. Reinke*, formerly of the *Ford Motor Co.* engineering department and *Ralph R. Johnston*, the bus was constructed from Dow metal at the plant of the *Dow Manufacturing Co.*, in Midland, Mich. This bus will go on an exhibition tour to Chicago, New York and other transportation centers during the month of August.

Announcement is made that the *American Forging and Socket Co.*, at Pontiac, manufacturers of automobile hardware, has started construction on additional plant facilities covering 20,000 square feet of space. It is expected the work will be completed about October 1, at a cost of approximately $150,000. This additional space has become necessary by an increased demand for the organization's order lines and for newly developed products.—F. J. H.

Los Angeles, Calif.

August 20, 1937.

The *Northrop Corporation* of El Segundo will spend $100,000 on an addition to the aeroplane plant, due to several millions of unfilled orders

The *Republic Sheet Metal Products* are moving to 1505 East 4th St.

The *West Coast Mfg. Co.*, of 5816 South Hooper Ave., are enlarging the factory, making builder's hardware.

W. J. Scanlon has started making siphons at 5222 Hollywood Blvd., using tin and alloys.

The *Union Die Casting Co.* have started making nut crackers.

The *Applied Research Laboratories* have started at 1240 Main St., making electric eyes.

The *Crosby Steam Gauge & Valve Co.* of Boston, Mass., have organized a Pacific Coast subsidiary, same name but of Calif., at 2034 Santa Fe Ave. *George H. Christian* is manager.

The *Huntington Park Sheet Metal Works*, at 6028 Pacific Blvd., at that city, have started in business. *M. Greenston* manager.

The *Pioneer Automatic Water Heater Mfg. Co.* have started at 556 San Fernando Road.

The *General Water Heater Corp.* at 1107 North Highland Ave., will enlarge their Burbank factory.

The *Berry Lamp Mfg. Co.* will enlarge factory at 2617 South San Pedro St.

The *Rose Rebuilt Tire Co.*, E. J. Rose at the head, have started a factory making cast aluminum alloy aeroplane wheels, that their special tires will fit on, at 2807 South Western Ave.—H. S.

North Pacific

August 20, 1937.

The *Western Stopper Co.* are enlarging their plant and doubling capacity of screw cap output, at 25th and Potrero Sts.

The *White Cap Co.* of Chicago, manufacturers of bottle caps, have opened a Pacific Coast office in the Merchants Exchange, San Francisco.

The *Forster Mfg. Co.*, makers of gas parts and equipment of Berkeley, Calif., have organized a subsidiary company at 232 East Erie St., Chicago, in charge of *C. M. Miller*.

The *Wesix Electric Heater Co.* of 390 First St., San Francisco, have started making a square type heater.

The *Elkington-Hellwig Mfg. Co.*, 19 South Park St., San Francisco, are now in full production making dish washing machines.—H. S.

Labeling Articles Made of Gold

The National Bureau of Standards, Washington, D. C., has received a request from the New England Manufacturing Jewelers' and Silversmiths' Association, Inc., for the establishment of a Commercial Standard for Marking Articles Made of Gold in Whole or in Part.

It is expected that this project will cover nomenclature, definitions, weights, thicknesses, tolerances, marking, and labeling.

Use of Copper Sets Record

The use of copper and its alloys this year by many of the leading consuming industries will establish a new high record according to the Copper and Brass Research Association, 420 Lexington Ave., New York. It is estimated that this year's use of brass pipe and copper tubing, which in 1936 established a record of 94,000,000 pounds, would exceed 100,000,000 pounds.

There were approximately 250,000,000 pounds of copper and its alloys used by the automobile industry in 1936. Production so far this year is about 12 per cent over 1936 despite strikes.

It has been estimated by the air-conditioning industry that sales will double last year's total of $50,000,000. In 1936 that industry used about 13,000,000 pounds of copper, brass and bronze, which was the largest in history. This year the total will likely exceed 25,000,000 pounds.

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Sales of oil burners for the first seven months of this year show a gain of about 25 per cent over 1936. Last year that industry used 20,000,000 feet of copper tubing, a new record, and this year the consumption should well exceed 25,000,000 feet.

The consumption of copper, brass and bronze in the electrical, mechanical refrigeration, radio and other industries will undoubtedly exceed the tonnage of 1936.

Courses in Electroplating

Dr. C. B. F. Young will offer four courses in Electroplating and Electrochemical Research at Columbia University, N. Y. C. during the coming school year. Registration will be during the period of September 17 to 25, 1937. The first class will be held at 7:00 P. M., Tuesday, September 28. Further information may be obtained by calling Dr. Young at Flushing 9-0633.

Chemical Engineering e83 Electroplating (Industrial Chemistry). Meets each Tuesday and Wednesday night in Room 356, Chandler Hall from 7:00 to 10:00 P. M. The course is designed to give the electroplater or industrial worker a foundation in chemistry. One hour of each lecture is used to discuss the modern theories of chemistry. The two remaining hours are utilized by the student in conducting his experiments under the supervision of the instructor. This course should precede *Chemical Engineering e84—Practical Electroplating*, which begins in the spring session.

Chemical Engineering e84 "Practical Electroplating". This course is designed to give the practical electroplater a study of ways and means of obtaining better deposits by applying the latest scientific methods of electrochemistry to electroplating. One hour of each evening is devoted to a lecture by the instructor and the remaining two hours are devoted to the application of these principles by the student in the laboratory.

The cost of each of these courses is a fee of $30.00, plus a small laboratory or breakage deposit.

In order to take care of students who desire further training, *Chemical Engineering e85 and e86, "Investigation of Special Problems in Electrochemistry"* has been established. The course is designed to give the practical electroplater or electrochemist a chance to investigate certain problems which are related to his field of work. One-half hour of each evening is devoted to a conference with the instructor, and the remaining two and one-half hours are spent in the laboratory where the student applies his knowledge and technique to the solving of problems which arise in such an investigation. The charge for these courses is a fee of $30.00 for each semester plus a deposit for breakage of $10.00.

The Ohio Mechanics Institute, Central Parkway and Walnut St., Cincinnati, O., has instituted evening courses in electroplating.

Electroplating I. Practical Electroplating. 1st and 2nd semesters, Friday, 7:00 P. M. to 9:30 P. M.

This course is intended for students of electroplating and electroplaters who wish to improve and extend their knowledge of their chosen field. The course is very practical in nature and can be understood readily by any student irrespective of his background. The classwork consists of a series of lectures and demonstrations on the various phases of electroplating including fundamental principles; cleaning methods; the electroplating of copper, cadmium, nickel, chromium, tin, zinc, silver, various alloys; plating room design; corrosion; reworking rejected material; plating and polishing processes; health hazards.

Electroplating II. Electroplating Solution Analysis. 2nd semester only, Wednesday, 7:00 P. M. to 9:30 P. M.

This is a laboratory course in the chemical analysis of all kinds of plating solutions and the determination of the thickness of the metal deposited. Previous knowledge of chemistry or electroplating is helpful but not essential in this course. Both chemical and practical methods of analysis will be considered and compared.

Ezra A. Blount is Instructor. Registration for the 1st semester may be made the week of September 27. The first lecture will be given Friday, October 1.

Metal and Glass In Building

The use of metal as well as glass is a distinguishing feature of the new Corning Glass Works building at 56th Street and Fifth Avenue, New York. To embellish the glass block exterior of the building gleaming bands of nickel silver were applied and a considerable amount of this metal was

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There is no "demand charge" for current that you do not use—no coal or coke or ashes to bother with, when your plant is equipped with Hausfeld Metal Melting Furnaces. Just open the valve on your gas line (during the months when gas is cheapest) or turn on your fuel oil valve when gas pressure is low—and presto! You have the hottest, most steady fire at the lowest possible cost. Down come your production costs! But your alloy analysis never changes!

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No plating—no polishing—no lacquering. Production expense cut 20%. A more attractive product. *Pre-finished* American Bonded Metals will probably do the same for your product. Our research department will help you find out. Write for free samples and further details.

BASIC METALS: Tin, Steel, Zinc, Brass, Copper.
FINISHES: Nickel, Chrome, Brass, Copper, Gold.
Strips, Sheets, Coils, Round Edge Flat Wire.
SURFACES: Bright, satin, striped, crimped, corrugated and embossed patterns.

AMERICAN NICKELOID COMPANY

8 SECOND STREET PERU, ILLINOIS

Sales Offices in All Principal Cities

also used in the interior. According to *C. E. Halbeck & Co.*, architectural metal contractors, 1,300 lineal feet of nickel silver molding, weighing 3,640 pounds, was used in the two glass block walls on the street sides of the building. Including 4,136 pounds of nickel silver for the entrance and interior doors and interior architectural trim, a total of 7,776 pounds of this metal will go into the building before final completion.

Verified Business Items

American Type Founders Incorporated, Elizabeth, N. J., manufacturer of type and printing presses, has adopted a cooperative group insurance program for its employees through which more than 900 workers are provided with a total of nearly $2,000,000 of life insurance. Announcement of the plan was made by *Thomas R. Jones*, president of the corporation. The insurance plan is being underwritten by the *Metropolitan Life Insurance Company* on a cooperative basis whereby the employer and employees share the cost.

General Electric Co., Schenectady, N. Y., has let general contract for one-story addition to branch plant on East Lake Road, Erie, for expansion in foundry. Cost over $50,000 with equipment.

Pulmosan Safety Equipment Corporation, 176 Johnson St., Brooklyn, N. Y., announces the resignation of *William H. Wahlert*, who severed his connections with the company on July 19. *Frederick Wahlert*, who is one of the pioneers in the industrial safety movement, will continue as active head of the corporation in the capacity of President. This change in no way affects the business policies of the organization.

Light Alloys Mfg. Co., Painesville, Ohio, recently organized to succeed *Light Alloys Co.*, whose plant was destroyed by fire several months ago, has leased former factory of *Bakelite Co.*, for production of aluminum castings and kindred specialties. New company is headed by *A. E. Walton*, president, and *R. E. Palmer*, vice-president and treasurer.

Ideal Commutator Dresser Co., Sycamore, Ill., has purchased the "Revolution Counter" business of the *Belden Manufacturing Co.* Hereafter this product will be marketed and manufactured at Sycamore.

Mid-West Electric Manufacturing Co., Chicago, Ill., manufacturer of electrical specialties, has let general contract for a one-story addition, 37 x 105 feet, to cost over $30,000 with equipment.

The former *Franklin* plant, of a million and one-quarter square feet, taken over recently for taxes by the City of Syracuse, was bid in at public auction today for *Carrier Corporation*, Newark, N. J., by *L. R. Boulware*, Vice-President and General Manager. It is expected that 80% of the administrative and productive operations of the air conditioning Company will be shifted to Syracuse within one year.

The *National Lead Company*, 115 Broadway, New York, has provided more than 5,000 employees with a total of approximately $18,000,000 of group life insurance, under a plan which supplements a group retirement annuity program installed by the company last January. The combined annuities and insurance plan is being underwritten by the *Metropolitan Life Insurance Company*.

A triple coverage group insurance program for employees of *General Malleable Corporation*, of Waukesha, Wis., manufacturer of malleable gray iron and aluminum castings, has been installed by an almost unanimous vote of the workers. The plan, which is underwritten by the Metropolitan Life Insurance Company, includes about $600,000 of life insurance, supplemented by sickness and non-occupational accident benefits, and approximately $600,000 accidental death and dismemberment protection. Announcement of the insurance program was made by *L. D. Harkrider*, president of the corporation.

Air Electric Machine Co., Jewell, Iowa, has been organized to manufacture wind electric machinery and equipment. *C. H. Christiansen* is president.

Hoban Brass Foundry, Dayton, O., was recently destroyed by fire. A new plant is being built on Patterson Blvd., south of Dayton, at a cost of $30,000.

Whether it's a heavy-duty job, or delicate jewelry finishing . . .

KALYE

SAVES *time*

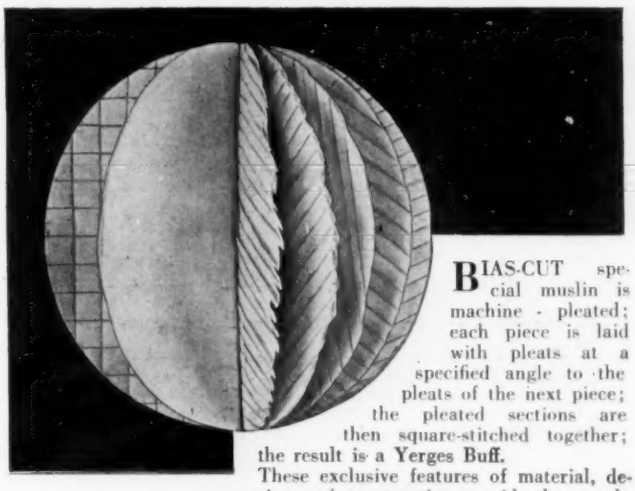
SAVES *material*

Recommended by 50 years of brilliant service on the most varied and exacting cleaning jobs.

Not the cheapest . . .
but *cheapest in the long run!*

Send for free copy of the Kalye manual.

RUMFORD CHEMICAL WORKS
RUMFORD, RHODE ISLAND



BIAS-CUT special muslin is machine - pleated; each piece is laid with pleats at a specified angle to the pleats of the next piece; the pleated sections are then square-stitched together; the result is a Yerges Buff.

These exclusive features of material, design and construction provide the matchless efficiency and long life of a Yerges Buff. They cut faster—saving labor cost. Pockets automatically form at the edge as the buff wears, holding and saving the abrasive. They do not fray at the edge.

These are reasons why so many manufacturers consistently use and inflexibly insist on Yerges Buffs. Available in wide variety meeting every requirement. Let us tell you—and show you—what a Yerges Buff will do for you.

YERGES MFG. CO., FREMONT, O.

YERGES

Evans Metal Co., Box 97 North Side Branch, Atlanta, Ga., has been organized to manufacture lead pipe and sheet. A plant will be completed about October 1. The main building is 50 x 200 ft. The rolling mill was built by E. W. Bliss Co., Salem, Ohio, and the 1000-ton capacity pipe press will come from John Robertson Co., Brooklyn, N. Y. *C. F. Evans* is president.

A. J. Wadhams, Vice-President in charge of Development and Research, The International Nickel Company, Inc., 67 Wall St., New York, has announced the addition of *Wayne Z. Friend* to the Development and Research Staff. Mr. Friend will devote most of his time to technical service on corrosion resisting materials, particularly Monel, Nickel and Inconel.

An electric furnace laboratory, where investigations and experiments will be concentrated for the continued development of electric heat-treating equipment, has been established at *General Electric's* Schenectady, N. Y. plant. It is being operated under the supervision of the Company's industrial heating engineering department.

McKenna Brass & Mfg. Corp., Pittsburgh, successor to McKenna Brass & Mfg. Co. Inc., is now located in its new plant at Dallas and Susquehanna Streets, for the manufacture of bottling machinery, bottle washers, carbonaters, filters and a general line of brass goods. Departments: brass, bronze and aluminum foundry; stamping shop; electroplating; lacquering.

Taylor Aircraft Co., Bradford, Pa., has purchased plant of Susquehanna Silk Mills, Lock Haven, Pa., including about 16 acres. New owner will remodel for new main plant, with parts production and assembling departments, replacing former works at Bradford, destroyed by fire several weeks ago with loss close to $150,000. Company plans airport at new location, with hangars, repair and reconditioning facilities, etc.

Corporation Earnings

NET PROFIT UNLESS FOLLOWED BY (L) WHICH IS LOSS

	1937	1936
Advance Aluminum Castings Corp. (6 mo.)	$70,847	$41,951
Anaconda Copper Mining Co. (6 mo.)	19,127,994	5,827,425
Bohn Aluminum and Brass Corp. (6 mo.)	1,441,081	693,843
Fagle-Picher Lead Co. (6 mo.)	745,954	338,520
International Nickel Co. (6 mo.)	25,914,352	17,456,974
Parker-Wolverine Co. (6 mo.)	232,124	
Revere Copper and Brass, Inc. (6 mo.)	2,122,838	733,430
Reynolds Metals Co. (6 mo.)	1,123,636	918,209
Yale & Towne Mfg. Co. (6 mo.)	734,576	409,135

Metal Market Review

August 23, 1937.

Copper tried to capitalize on the improved sentiment which appeared during the previous month. The attempt came in the form of increased speculation in London and a sharp rise in sales, which were, week by week, 13,118; 29,063; 32,726 and 12,607 tons, a total of 87,514 tons. The demand reflected increased confidence in the price situation and came, to a considerable extent, from independent consumers. Total sales during July in the domestic market were 62,297 tons compared with 35,395 tons in June.

The price of domestic copper remained at 14c per pound electrolytic throughout but the export price varied from about 14 to 14.75, the peak occurring in the third week, followed by a recession and much quieter business during the fourth week as shown by the above sales figures.

Stocks of refined copper in the United States increased in July for the third consecutive month but only moderately, rising from 111,020 tons to 117,741 tons. Stocks of refined metal for the world increased from 300,445 tons to 313,115 tons. Blister stocks increased 5,958 tons in the United States but decreased 8,955 tons abroad. At this time the market is quiet and rather uncertain.

Zinc continued the upward trend of the previous month. During the first two weeks inquiry was active and the spot market was

Unbuffed Deposits Produced in a Nickel Bath Before and After the Addition of Lustrebright.

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NICKEL BRIGHTENING PROCESS
ELIMINATES COLOR BUFFING
RE-CLEANING — RE-RACKING

AN IDEAL BASE FOR CHROMIUM

One gallon of LUSTREBRIGHT added to 100 gallons of cold nickel solution produces brilliant deposits on highly colored work, die-castings included. For use direct on steel in mechanical barrel only.

Guaranteed Not to Harm Plating Solution or Cause Plate to Peel or Become Brittle

Let us ship you 5 gallons for a thorough test on your own product on a money back guarantee if you are not satisfied.

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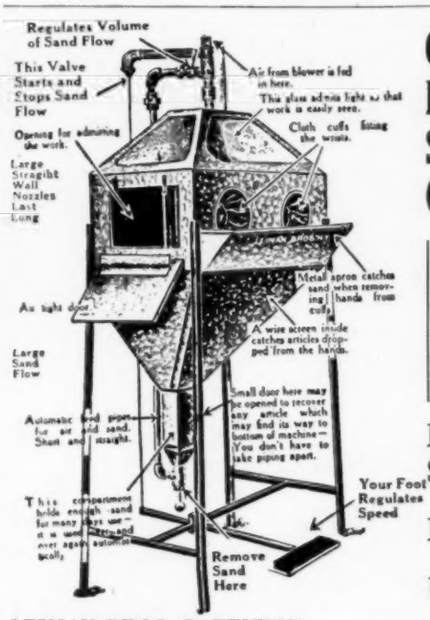
240 Sheridan Ave. Albany, N. Y.



LEIMAN BROS. PATENTED CONTINUOUS FEED

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A LABOR SAVER IN CLEANING MOULDING SAND FROM CASTINGS

CLEAN HARDENING SCALE QUICKLY

for Better Machining
Better Plating Enamel or Paint

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NO ACIDS

UNIFORM RESULTS

LEIMAN BROS., INC., 171 CHRISTIE ST. NEWARK, N. J.
NEW YORK CO., 23 WALKER STREET
MAKERS OF GOOD MACHINERY FOR 50 YEARS

decidedly tight though the price remained at 7c per pound, Prime Western, E. St. Louis. On August 9, however, the price was increased to 7.25 where it remains at this time with the situation still tight for spot metal and forward business on the books of the producers at the record total of 106,232 tons.

Statistics showed a small reduction in stocks from 14,081 tons to 13,561 tons. Sales week by week were: 12,000; 6,519; 23,616 and 11,590 tons, a total of 51,725 tons.

Tin showed very little vitality, it eased off slightly during the first two weeks of the last four-week period, going down as low as 58.75 per lb. Straits. It rebounded slightly to 60.425 and now stands at 59.50. July's statistics disclosed that the world's visible supply of tin increased 2,355 long tons.

Lead was consistently strong throughout, with demand in excess of offerings by producers, with the result that on August 4, the price was increased from 5.85c per pound St. Louis to 6.10, and again on August 5 to 6.35 where it now rests. Sales were: 10,200; 11,057; 11,515 and 2,200 tons, a total of 34,972 tons. At this time the consuming market seems to feel that the present figure is likely to hold over for a while, although the undertone remains firm.

June's statistics showed a drop in stocks from 115,843 tons to 113,370 tons. July showed a further reduction to 111,103 tons.

Silver was inactive and unchanged throughout at 44¾c per ounce Troy. During June the United States produced 5,487,000 ounces compared with 5,280,000 ounces in May. Production in the first half of 1937 was 32,060,000 ounces compared with 29,852,000 ounces in the first half of 1936, according to the American Bureau of Metal Statistics.

American silver producers who financed a survey covering the industrial possibilities of silver several years ago have now established 15 fellowships at 9 institutions to explore the leads opened at the previous study according to *Dr. Lyman J. Briggs*, director of the National Bureal of Standards, Washington, D. C.

Scrap Copper followed the export quotations most of the time. After the first week since our last issue, quotations fluctuated with exporters outbidding domestic refiners for metal until the week of August 16th when export demand became very dull. Lead scrap, of course, ruled higher due to the upward movements of the primary metal. Brass ingot was slow except for one spurt, short-lived, during the week of August 9, after which brass ingot prices were reduced ½c (Monday, August 16). Aluminum ingot was steady and in fair demand throughout, without change in price.

On August 1 unfilled orders for brass and bronze ingots and billets on the books of the members of the Non-Ferrous Ingot Metal Institute amounted to a total of 17,542 net tons compared with 15,784 net tons on July 1.

The combined deliveries of brass and bronze ingots and billets by members for July amounted to a total of 7,087 tons compared with 6,584 tons in June.

The Institute reports the average prices per pound received by its membership on commercial grades of the principal mixtures of ingot brass during the 28-day period ending August 6:

80-10-10 (1½% Imp.)	15.785c
78% Metal	13.006c
81% Metal	13.258c
83% Metal	13,518c
85% Metal	13.771c
No. 1 Yellow Brass	11.046c

Average Prices for Metals

	July
COPPER c/lb. Duty 4c/lb.	
LAKE (del. Conn. Producers' Prices)	14.062
ELECTROLYTIC (del. Conn. Producers' Prices)	14.00
CASTING (f.o.b. ref.)	13.625
ZINC (f.o.b. E. St. Louis) c/lb. Duty 1¾ c/lb.	
Prime Western (for Brass Special add 0.05-0.10)	6.923
TIN (f.o.b. N. Y.) c/lb. Duty Free, Straits	59.245
LEAD (f.o.b. St. L.) c/lb. Duty 2½ c/lb.	5.85
ALUMINUM c/lb. Duty 4 c/lb.	20.000
NICKEL c/lb. Duty 3 c/lb. Electrolytic 99.9%	35.000
ANTIMONY (Ch. 99%) c/lb. Duty 2c/lb.	14.803
SILVER c/oz. Troy, Duty Free	44.75
PLATINUM $/oz. Troy, Duty Free	49.595
GOLD—Official U. S. Treasury Price $/oz. Troy	35.000

OAKEY'S
EMERY and
EMERY CLOTH

The continued maintenance of supreme quality, durability and satisfaction to the user enhances the world-wide reputation of the name of Oakey, enjoyed for more than 100 years.

WELLINGTON MILLS EMERY
AND
ENGINEERS' EMERY CLOTH

Representatives:
HAAS BROS., 75, West Street, New York City.

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John Oakey & Sons Limited, Wellington Mills, London, England.

AWAY AHEAD IN DUST PROTECTION AND COMFORT

M·S·A Comfo RESPIRATOR
U. S. Pat. No. 2,019,998

PROTECTION, even against *invisible* dust, plus lightweight comfort, effortless breathing and unrestricted vision have made the M.S.A. Comfo Respirator a country-wide favorite. Two types are available, *both U. S. Bureau of Mines-approved:* one for silica and other pneumoconiosis-producing dusts and chromic acid mists; the other for lead dust. ● Let us demonstrate the Comfo Respirator on your own jobs—there's no obligation.

MINE SAFETY APPLIANCES CO.
Braddock, Thomas and Meade Streets, Pittsburgh, Pa.
District Representatives in Principal Cities

M.S.A. Products include Breathing Apparatus . . . Inhalators . . . Comfo Respirators . . . Masks of all Types . . . Gas Indicators . . . Gas Detectors . . . Safety Goggles . . . Protective Hats and Caps . . . Edison Electric Cap Lamps . . . Safety Clothing . . . First Aid Equipment. Descriptive Bulletins will be sent on request.

Supply Prices, August 26, 1937

Anodes

Prices, except silver, are per lb. f.o.b., shipping point, based on purchases of 2,000 lbs. or more, and subject to changes due to fluctuating metal markets.

COPPER:	Cast	24⅛c. per lb.	
	Electrolytic, full size, 18⅜c. cut to size	18⅜c. per lb.	
	Rolled oval, straight, 18⅞c.; curved	19⅞c. per lb.	
BRASS:	Cast	22½c. per lb.	
ZINC:	Cast	13½c. per lb.	
NICKEL:	90-92%	.45 per lb.	
	95-97%	.46 per lb.	
	99%+cast, 47c.; rolled, depolarized, 48.		
SILVER:	Rolled silver anodes .999 fine were quoted Aug. 26, from 48c. per Troy ounce upward, depending on quantity.		

White Spanish Felt Polishing Wheels

Diameter	Thickness Under ½"	½-15/16"	1-2"	2-3½"	Over 3½"
Under 1"	6.35-6.40	6.20-6.25	6.10-6.15	6.10-6.15	6.35-6.40
1" to 1 7/16"	5.85	5.70	5.60	5.60	5.85
1½" to 3 15/16"	5.55	5.35-5.40	5.30-5.35	5.30-5.35	5.60
4-5 15/16"	4.95-5.00	4.70-4.85	4.65-4.75	4.65-4.75	4.95-5.00
6", 8" & 9"	3.80-4.25	3.45-3.95	2.45-3.05	2.45-3.00	2.90-3.35
10" to 18"	3.80-4.25	3.45-3.95	2.45-2.95	2.45-2.75	2.90-3.25
Over 18"	3.80-4.25	3.45-3.95	2.70-3.05	2.70-3.00	2.90-3.35

Prices above are for less than 50 lb. For 50 to 99 lb. deduct 5% from list; for 100 lb. and over deduct 10%.

ODD DIAMETERS: (7" & 11" to 17"). Less than 50 lb. add 40c per lb. to above "Even Diameters" list. 50 lb. or over—all one size and consistency and in one shipment—same as "Even Diameters" list above.

On grey Mexican wheels deduct 10c per lb. from above prices.

Cotton Buffs

Full disc open buffs, per 100 sections when purchased in lots of 100 or less are quoted:

16" 20 ply 84/92 Unbleached	$77.70
14" 20 ply 84/92 Unbleached	59.43
12" 20 ply 84/92 Unbleached	44.67
16" 20 ply 80/92 Unbleached	65.72
14" 20 ply 80/92 Unbleached	50.43
12" 20 ply 80/92 Unbleached	37.91
16" 20 ply 64/68 Unbleached	62.13
14" 20 ply 64/68 Unbleached	47.70
12" 20 ply 64/68 Unbleached	35.88

⅜" Sewed Buffs, per lb., bleached or unbleached 59c to $1.58

Chemicals

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone C. P.	lb.	.06½
Acid—Boric (Boracic) granular, 99½+% ton lots	lb.	.05¼-.05¾
Chromic, 400 or 100 lb. drums		.16¼-.16¾
Hydrochloric (Muriatic) Tech., 20 deg., carboys	lb.	.027
Hydrochloric, C. P., 20 deg., carboys	lb.	.08
Hydrofluoric, 30%, bbls.	lb.	.07-.08
Nitric, 36 deg., carboys	lb.	.06
Nitric, 42 deg., carboys	lb.	.07½
Sulphuric, 66 deg., carboys	lb.	.02½
Alcohol—Butyl, drums	lb.	.10-.10½
Denatured, drums	gal.	.35-.40
Alum—Lump, barrels	lb.	.0340-.0365
Powdered, barrels	lb.	.0355-.0380
Ammonia, aqua, com'l., 26 deg., drums, carboys	lb.	.02½-.05¼
Ammonium—Sulphate, tech., bbls.	lb.	.03½-.05
Sulphocyanide, technical crystals, kegs	lb.	.55-.58
Arsenic, white kegs	lb.	.04½-.05
Asphaltum, powder, kegs	lb.	.23-.41
Benzol, pure, drums	gal.	.41
Borax, granular, 99½+%, ton lots	lb.	.0255-.0305
Cadmium oxide, 50 to 1,000 lbs.	lb.	1.60
Calcium Carbonate (Precipitated Chalk), U. S. P.	lb.	.05¾-.07½
Carbon Bisulphide, drums	lb.	.05¼-.06
Chrome, Green, commercial, bbls.	lb.	.21½
Chromic Sulphate, drums	lb.	.26¼
*Copper—Acetate (Verdigris)	lb.	.25
Carbonate, 53/55% cu., bbls.	lb.	.18
Cyanide (100 lb. kgs.)	lb.	.28
Sulphate, tech., crystals, bbls.	lb.	.0585
Cream of Tartar Crystals (Potassium Bitartrate)	lb.	.20¼-.20½
Crocus Martis (Iron Oxide) red, tech., kegs	lb.	.07
Dextrin, yellow, kegs	lb.	.05-.08
Emery Flour (Turkish)	lb.	.07
Flint, powdered	ton	30.00
Fluorspar, bags	lb.	.03½
*Gold Chloride	oz.	$18¼-23
*Gold Cyanide, Potassium 41%		$15.45
*Gold Cyanide, Sodium 46%		$17.10
Gum—Sandarac, prime, bags	lb.	.50
Shellac, various grades and quantities	lb.	.21-.31
Iron Sulphate (Copperas), bbls.	lb.	.016
Lead—Acetate (Sugar of Lead), bbls.	lb.	.13½-.16¼
Oxide (Litharge), bbls.	lb.	.12½
Lime Compositions for Nickel	lb.	.09½-.11
Lime Compositions for Brass	lb.	.09½-.11
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.58
Methanol, (Wood Alcohol) Pure, drums	gal.	.40½
Nickel—Carbonate, dry bbls.	lb.	.36-.41
Chloride, bbls.	lb.	.18-.22
Salts, single, 425 lb. bbls.	lb.	.13½-.14½
Salts, double, 425 lb. bbls.	lb.	.13½-.14½
Paraffin	lb.	.05-.06
Phosphorus—Duty free, according to quantity	lb.	.35-.40
Potash Caustic Electrolytic 88-92% broken, drums	lb.	.07¼-.08⅝
Potassium—Bichromate, casks (crystals)	lb.	.09
Carbonate, 98-100%	lb.	.06¾
Cyanide, 165 lbs. cases, 94-96%	lb.	.57½
Pumice, ground, bbls.	lb.	.03
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.04½
Sal Ammoniac (Ammonium Chloride) in bbls.	lb.	.05-.07½
*Silver—Chloride, dry, 100 oz. lots	oz.	.38
Cyanide, 100 oz. lots	oz.	.44
Nitrate, 100 ounce lots	oz.	.32¾
Soda Ash, 58%, bbls.	lb.	.02½
Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.17½-.22
Hyposulphite, kegs, bbls.	lb.	.03½-.06½
Metasilicate, granular, bbls.	lb.	2.75-3.15
Nitrate, tech., bbls.	lb.	.0325
Phosphate, tribasic, tech., bbls.	lb.	.03
Silicate (Water Glass), bbls.	lb.	.01½
*Stannate, drums	lb.	.38-.41
Sulphocyanide, drums	lb.	.30-.35
Sulphur (Brimstone), bbls.	lb.	.02¾
*Tin Chloride, 100 lb. kegs	lb.	.43
Tripoli, powdered	lb.	.03
Trisodium Phosphate—see Sodium Phosphate.		
Wax—Bees, white, ref. bleached	lb.	.60
Yellow, No. 1	lb.	.45
White Silica Compositions for Brass	lb.	.07½-.10
Whiting, Bolted	lb.	.02½-.06
Zinc—Carbonate, bbls.	lb.	.13
Cyanide (100 lb. kegs)	lb.	.37
Chloride, drums, bbls.	lb.	.08
Sulphate, bbls.	lb.	.04

* Subject to fluctuations in metal prices.

Metal Prices on page 484.

Besplate
NICKEL ANODES

ARE QUALITY PRODUCTS • • •

LEADERS in the Nickel Plating Industry have standardized on McGean Besplate 99% Nickel Anodes — Because

1. Cathode Deposits are smoother
2. Anode corrosion is excellent
3. Less frequent filtering of solution required

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We Also Offer

Genuine Rolled Oval
Depolarized Nickel Anodes

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From our complete line of Anodes and Plating Chemicals we call your attention to the following.

ANODES

Nickel (all percentages)	Tin
Copper	Brass
Cadmium	Zinc

CHEMICALS

Nickel Salts	Copper Sulphate
Nickel Chloride	Copper Cyanide
Nickel Carbonate	Copper Carbonate
Chromic Acid	Cadmium Oxide

Manufactured by

THE McGEAN CHEMICAL COMPANY
CLEVELAND, OHIO

McGEAN CHEMICALS

METEX
Grade R

The nearest thing to an "ALL-AROUND" METAL CLEANER yet produced.

No ONE cleaning material can handle all types of work. But the improved METEX Grade "R" has proved so exceptionally versatile that we confidently recommend it for the great majority of industrial metal cleaning operations. It may be counted upon to reduce both the *number* of cleaning compounds you must use and the *cost* of cleaning parts in process.

Write us an outline of your cleaning problems and schedule. Let us show you how you can secure better results more economically with METEX Grade "R" or one of the many *specialized* METEX Cleaners.

MACDERMID
INCORPORATED
WATERBURY **CONNECTICUT**

METEX
Metal Cleaners
MATERIALS **EQUIPMENT**

Methods
FOR METAL CLEANING AND FINISHES

Metal Prices, August 26, 1937

(Import duties and taxes under U. S. Tariff Act of 1930, and Revenue Act of 1932)

New Metals

COPPER: Lake, 14.125, Electrolytic, 14.00, Casting, 13.75.
ZINC: Prime Western, 7.25. Brass Special, 7.35.
TIN: Straits 58.50. LEAD: 6.35.
ALUMINUM: 20. ANTIMONY, Ch. not quoted. Amer. 15.25.
NICKEL: Shot, 36. Elec., 35.
QUICKSILVER: Flasks, 75 lbs., $91-93. BISMUTH, $1.00.
CADMIUM, $1.60 (nom.). SILVER, Troy oz., official price, N. Y., Aug. 26, 44¾c. GOLD: Oz. Troy, Official U. S. Treasury price, $35.00.
SCRAP GOLD, 6¾c. per pennyweight per karat, dealers' quotation.
PLATINUM, oz. Troy $51.00.

Duties: Copper, 4c. lb.; zinc, 1¾c. lb.; tin, free; lead, 2½c. lb.; aluminum, 4c. lb.; antimony, 2c. lb.; nickel, 3c. lb.; quicksilver, 25c. lb.; bismuth, 7½%; cadmium, 15c. lb.; cobalt, free; silver, free; gold, free; platinum, free.

Ingot Metals and Alloys

	Cents lb.	U. S. Import Duty	U. S. Import Tax*
No. 1 Yellow Brass	11.50	None	4c. lb.[1]
85-5-5-5	14.25	None	4c. lb.[1]
88-10-2	18.50	None	4c. lb.[1]
80-10-10	16.50	None	4c. lb.[1]
Manganese Bronze (60,000 t. s. min.)	13.50	None	4c. lb.[1]
Aluminum Bronze	17.75	None	4c. lb.[1]
Monel Metal Shot or Block	28	25% a. v.	None
Nickel Silver (12% Ni)	15.50	20% a. v.	4c. lb.[1]
Nickel Silver (15% Ni)	17.75	20% a. v.	4c. lb.[1]
No. 12 Aluminum	19-25	4c. lb.	None
Manganese Copper, Grade A (30%)	25.50-31	25% a. v.	3c. lb.[1]
Phosphor Copper, 10%	19-21	3c. lb.	4c. lb.[1]
Phosphor Copper, 15%	20-22	3c. lb.	4c. lb.[1]
Silicon Copper, 10%	24-36	45% a. v.	4c. lb.[1]
Phosphor Tin, no guarantee	65-75	None	None
Iridium Platinum, 5% (Nominal)	$53.50	None	None
Iridium Platinum, 10% (Nominal)	$56.00	None	None

* Duty is under U. S. Tariff Act of 1930; tax under Section 80 (7) of Revenue Act of 1932.
[1] On copper content. [2] On total weight. "a. v." means ad valorem.

Old Metals

Dealers' buying prices, wholesale quantities:

	Cents. lb.	Duty	U. S. Import Tax
Heavy copper and wire, mixed	10¼to10½	Free	4c. per pound on copper content
Light copper	9½to 9¾	Free	
Heavy yellow brass	6½to 6¾	Free	
Light brass	6	Free	
No. 1 composition	9 to 9¼	Free	
Composition turnings	8¾to 9	Free	
Heavy soft lead	5⅞	2⅛c. lb.	None
Old zinc	4 to 4¼	1½c. lb.	
New zinc clips	5¾to 6	1½c. lb.	
Aluminum clips (new, soft)	14¼to14½	4c. lb.	
Scrap aluminum, cast	12½to12¾	4c. lb.	
Aluminum borings—turnings	8 to 9	4c. lb.	
No. 1 pewter	41 to 42	Free	
Electrotype	5¾to 6	2⅛c. lb.*	
Nickel anodes	30	10%	
Nickel clips, new	30 to 31	10%	
Monel scrap	8½to16½	10% av.	

* On lead content.

Wrought Metals and Alloys

The following are net BASE PRICES per pound, to which must be added extras for size, shape, quantity, packing, etc., or discounts, as shown in manufacturers' price lists, effective since May 19, 1937. Basic quantities on most rolled or drawn brass and bronze items below are from 2,000 to 5,000 pounds; on nickel silver, from 1,000 to 2,000 pounds.

Copper Material

	Net base per lb.	Duty*
Sheet, hot rolled	21⅞c.	2½c. lb.
Bare wire, soft, less than carloads	18⅛c.	25% a. v.
Seamless tubing	22⅝c.	7c. lb.

*** Each of the above subject to import tax of 4c. lb. in addition to duty under Revenue Act of 1932.**

Nickel Silver

Net base prices per lb. (Duty 30% ad valorem.)

Sheet Metal		Wire and Rod	
10% Quality	29½c.	10% Quality	32⅛c.
15% Quality	31⅝c.	15% Quality	36½c.
18% Quality	32⅞c.	18% Quality	39¾c.

Brass and Bronze Material

	Yellow Brass	Red Brass 80%	Comm'l. Bronze	Duty	U. S. Import Tax
Sheet	19¾c.	20¾c.	21¾	4c. lb.	4c. lb. on copper content.
Wire	20 c.	21 c.	22	20%	
Rod	16¼c.	21 c.	21⅞	4c. lb.	
Angles, channels	28¼c.	29¼c.	30¼	1c2. lb.	
Seamless tubing	22½c.	23¼c.	24⅛	8c. lb.	
Open seam tubing	28¼c.	29¼c.	30¼	20% a.v.	

Tobin Bronze and Muntz Metal

(Duty 4c. lb.; import tax 4c. lb. on copper content.)

Net base prices per pound.	
Tobin Bronze Rod	21⅝c.
Muntz or Yellow Rectangular and other sheathing	23 c.
Muntz or Yellow Metal Rod	19⅛c.

Aluminum Sheet and Coil

(Duty 7c. per lb.)

Aluminum sheet, 18 ga., base, ton lots, per lb.	35.50c
Aluminum coils, 24 ga., base price, ton lots, per lb.	31.00c

Rolled Nickel Sheet and Rod

Net Base Prices

Cold Drawn Rods	50c.	Standard Cold Rolled Sheet	49c.
Hot Rolled Rods	45c.		

Monel Metal Sheet and Rod

Hot Rolled Rods (base)	35c.	No. 35 Sheets (base)	37c.
Cold Drawn Rods (base)	40c.	Std. Cold Rolled Sheets (base)	39c.

Silver Sheet

Rolled sterling silver (Aug. 26) 47c. per Troy oz. upward according to quantity. (Duty, 65% ad valorem.)

Zinc and Lead Sheet

	Cents per lb. Net Base	Duty
Zinc sheet, carload lots standard sizes and gauges, at mill, less 7 per cent discount	12.25	2c. lb.
Zinc sheet, 1200 lb. lots (jobbers' prices)	13.25	2c. lb.
Zinc sheet, 100 lb. lots (jobbers' prices)	17.25	2c. lb.
Full Lead Sheet (base price)	9.75	2⅝c. lb.
Cut Lead Sheet (base price)	10.00	2⅝c. lb.

Block Tin, Pewter and Britannia Sheet

(Duty Free)

This list applies to either block tin or No. 1 Britannia Metal Sheet, No. 23 B. & S. Gauge, 18 inches wide or less; prices are all f. o. b. mill:

500 lbs. over	15c. above N. Y. pig tin price
100 to 500 lbs.	17c. above N. Y. pig tin price
Up to 100 lbs.	25c. above N. Y. pig tin price
Up to 100 lbs.	25c. above N. Y. pig tin price

Supply Prices on page 482.

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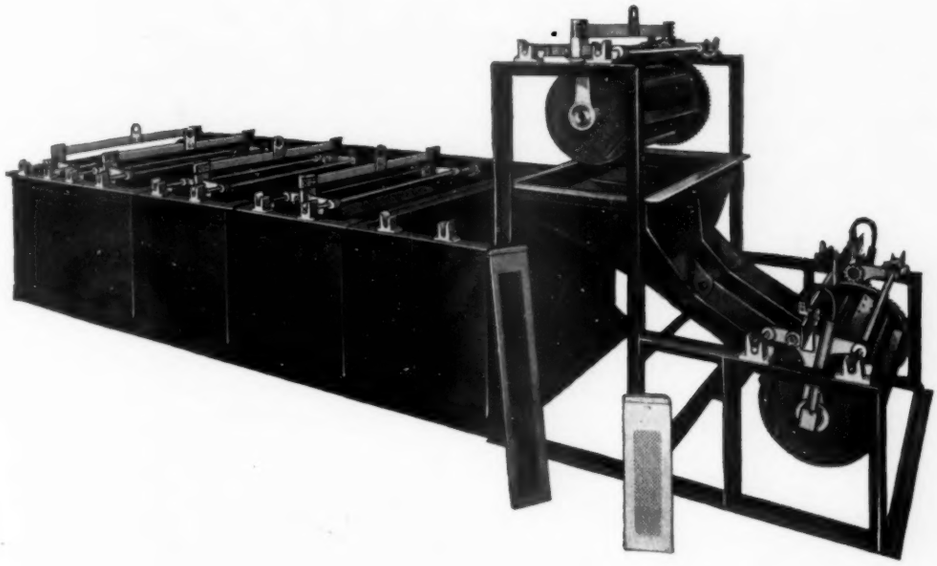

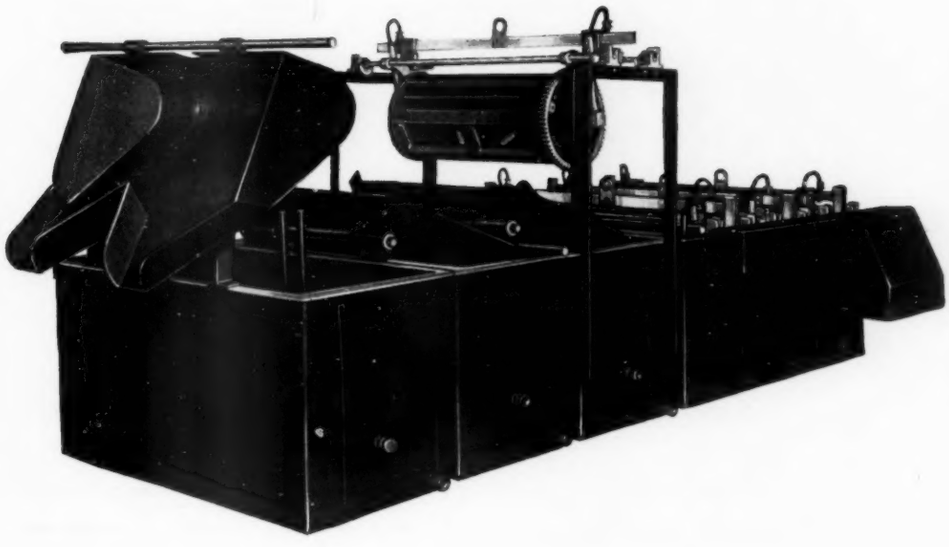

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• CONTENTS •

VOLUME 35 OCTOBER, 1937 NUMBER 10

***METAL INDUSTRY** articles are listed regularly in the Engineering Index and the Industrial Arts Index.*

Publication Office: 116 John Street, New York, N. Y.

Founded January, 1903 *by* PALMER H. LANGDON, 1868-1935

L. J. LANGDON, *Publisher*
ADOLPH BREGMAN, *Managing Editor*
PALMER H. LANGDON, *Assistant Editor*
THOMAS A. TRUMBOUR, *Business Manager*
JOAN TRUMBOUR, *Asst. Advertising Mgr.*

ADVERTISING RATES on application. Forms close the first of the month. Advertising copy should be mailed in time to reach us on or before the 20th of the preceding month.

METAL INDUSTRY reserves the right to investigate all products offered for advertisement, to refuse advertising considered unsuitable and to edit advertising copy when necessary.

Buyers' Guide Advertising P. 39

MEMBER AUDIT BUREAU OF CIRCULATIONS

PUBLISHED MONTHLY—Copyright 1937 by The Metal Industry Publishing Company, Incorporated, 116 John St., New York, N. Y. Entered February 25, 1903, at New York, N. Y., as second class matter under Act of Congress, March 3, 1879.

SUBSCRIPTION PRICES: United States and Canada, $2.00 Per Year; Foreign $4.00. Single copies, 20 CENTS. Please remit by check or money order; cash should be registered.